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Stonewall Vegetation Project

Final Environmental Impact Statement - Volume 1

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Stonewall Vegetation Project
Final Environmental Impact Statement
Lewis and Clark and Powell Counties, Montana

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Abstract: The Lincoln Ranger District of the Helena National Forest proposes to treat stands within an analysis area of about 24,010 acres to improve long-term forest health and reduce fuels within the Stonewall Vegetation project area. The Forest Service developed three alternatives, including: the no action (alternative 1), the proposed action (alternative 2) and an additional alternative created in response to issues raised during public scoping (alternative 3). Several other alternatives were considered but dropped from detailed analysis (see chapter 2). Treatments were designed to improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects, and modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape.

Alternative 2 proposes a total of 8,564 acres (about 36 percent of analysis area) of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 3,099 acres. Fuels treatments would follow timber removals, including slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is also proposed within the inventoried roadless areas (IRAs) to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 4,182 acres (about 0.5 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Area and on 664 acres (about 3.8 percent) within the Lincoln Gulch Inventoried Roadless Area. Outside of the IRAs, approximately 2.6 miles of road would be built then obliterated immediately following timber removal. Treatments proposed under alternative 2 would reduce elk hiding and thermal cover in both the Beaver Creek and Keep Cool Creek herd units, whereas the amount and distribution of forage would increase. Neither herd unit would meet Forest Plan standard 3 or 4a. This alternative would require a site-specific, nonsignificant forest plan amendment for standards 3 and 4(a) for the reductions in elk hiding cover and thermal cover as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3.

Alternative 3 proposes a total of 6,564 acres (about 27 percent of analysis area) of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 2,298 acres. Fuels treatments would follow timber removals, including slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is proposed within the Bear Marshall Scapegoat Swan Inventoried Roadless Area to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 3,565 acres (about 0.4 percent) within the Bear Marshall Scapegoat Swan

Inventoried Roadless Area. The Lincoln Gulch Inventoried Roadless Area would not be treated. Outside of the IRAs, approximately 0.4 mile of road would be built then obliterated immediately following timber removal. Treatments proposed under alternative 3 would reduce elk hiding and thermal cover in both the Beaver Creek and Keep Cool Creek herd units, whereas the amount and distribution of forage would increase. Neither herd unit would meet Forest Plan standard 3 or 4a.This alternative would require a site-specific, nonsignificant forest plan amendment for standards 3 and 4(a) for the reductions in elk hiding cover and thermal cover as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3.

Preferred Alternative

Alternative 3 is the Preferred Alternative. This alternative was developed to address issues raised during scoping regarding reducing potential impacts to habitat for threatened, endangered and sensitive species and designated critical habitat; management indicator species (MIS); big game hiding cover, thermal cover, and security cover. Treatments were reviewed and adjusted to reduce impacts to habitat.

Alternative 3 proposes a total of 6,564 acres of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 2,298 acres. Fuels treatments would follow timber removals and include slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is proposed within the Bear Marshall Scapegoat Swan Inventoried Roadless Areas to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 3,565 acres (about 0.4 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Areas. The Lincoln Gulch Inventoried Roadless Areas would not be treated under this alternative. To help facilitate management, outside the IRAs approximately 0.4 mile of road would be built then obliterated immediately following timber removal.

This proposed project would implement the Helena National Forest, Forest Plan; it is not authorized under the Healthy Forest Restoration Act. This proposed project is subject to 36 CFR 218 subparts A and B, and will be subject to the objection process pursuant to 36 CFR part 218.

Summary

The Helena National Forest, Lincoln Ranger District, is proposing the Stonewall Vegetation Project in response to public interest to work with the Forest Service conducting landscape management activities. The area affected by the proposal includes approximately 24,010 acres (approximately 23,670 acres are National Forest System lands) within Lewis and Clark and Powell Counties, Montana. The project area is on the Lincoln Ranger District, approximately 4 miles north and west of the town of Lincoln, Montana. Proposed activities would include using commercial and noncommercial treatments to move towards desired conditions. Proposed actions include: regeneration harvest, intermediate harvest, precommercial thinning, and prescribed burning. The proposed action includes using prescribed fire and tree slashing to promote ecological restoration of a mix of vegetation composition and structure across the landscape within the Bear-Marshall-Scapegoat-Swan and Lincoln Gulch Inventoried Roadless Areas (IRA). Prescribed fire is proposed on up to 4,182 acres (about 0.5 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Area, and up to 664 acres (about 3.8 percent) within the Lincoln Gulch Inventoried Roadless Area. Commercial timber harvest and road construction would not occur in the two roadless areas. Outside the roadless areas, approximately 2.6 miles of road would be built then obliterated immediately following timber removal.

This action is needed to address differences between the existing conditions and desired conditions described in the Forest Plan (pg. II/1 and II/2 goals 4, 10, 11, 14 and 16) (USDA Forest Service 1986). See chapter 1 management direction and existing condition descriptions. Existing conditions within the greater watershed area includes declines of ponderosa pine, western larch, and aspen habitats, elevated fuels in the wildland urban interface, and a landscape-level departure from natural fire processes. After the 2003 Lincoln Complex Fires that burned approximately 36,000 acres and required a partial evacuation of the community of Lincoln, residents expressed a desire to see forest management designed to reduce the risk of future catastrophic events. The fire risk and fuels concerns for this area were also identified in the Community Wildfire Protection Plan (Tri-County Fire Working Group 2005) as the highest priority need for treatment.

Development of the Proposed Action

The Lincoln Restoration Committee (LRC) of the Montana Forest Restoration Committee (MFRC) is a group of private citizens with diverse community interests who came together in 2008 (formerly as the Lincoln Working Group) with the purpose of developing recommendations for restoration projects on the Lincoln Ranger District, while working within the framework developed by the MFRC. The Helena National Forest has been working with the LRC in compliance with Executive Order 13352 of August 2004—Facilitation of Cooperative Conservation.

The proposed action was developed over time involving three areas. Two areas were brought forward to the Forest Service by the LRC, and the third area was developed after Forest Service specialists reviewed conditions within the entire watershed (Cole 2009a, b; Cole 2010; Farley 2009; Heinert 2009a, b; Ihle 2010; Kurtz 2009; Lundberg and Alvino 2006; Marr 2009; Milburn et al. 2006; Milburn 2009; Olsen 2010a, b, c; Randall 2009; Shanley 2009, 2010; Sitch 2009; USDA Forest Service 2010; Walch 2010; Wyatt 2009). This analysis covers all three areas. The recommended actions associated with the three areas are consistent with the goals in the Forest Plan (see table 1. Crosswalk of MFRC Principles with Forest Service direction).

In addition, a Forestwide landscape-level assessment of insect conditions and predictions was done in 2008 (Kamps et al. 2008) that identified the Stonewall area as a high priority for management. The Lincoln community is very aware of the mountain pine beetle epidemic and high levels of western spruce budworm activity across the landscapes in the Upper Blackfoot Valley and west side of the Continental Divide.

Benefits anticipated as an outcome of proposed actions include: restoration of ponderosa pine, dry Douglas-fir, and western larch sites to a more natural fire regime; maintain or improve vigor and restore aspen groves and whitebark pine; and enhance wildlife habitat conditions.

Public Involvement

We published the Notice of Intent (NOI) in the *Federal Register* on January 13, 2010 (75 FR 1748). The NOI asked for public comment on the proposal to be received by February 22, 2010. We sent about 700 letters explaining the proposal and asking for comment to interested individuals, groups and agencies on January 15, 2010. In addition, as part of the public involvement process, we held an open house on February 3, 2010, and project information was available on the Forest website at www.fs.usda.gov/helena/. The project has been listed in the Forest's Schedule of Proposed Actions since April 1, 2010. Appendix A of the draft environmental impact statement included the content analysis of the scoping comments received.

We received a total of 80 scoping responses via email, public comment form and letters; 30 were in support of the proposed project activities. The majority of responses suggested information to include in the analysis documents, identified language to clarify, or listed elements pertaining to a specific resource to include in the effects analyses. The resource specialists' reports include this information as well as the analysis of the project effects on the various resources. The resource specialists' reports are filed in the project record and incorporated by reference and summarized in Chapter 3 – Affected Environment and Environmental Consequences, of this draft EIS.

Eight responses expressed concerns or suggestions regarding travel management of area roads and motorized, winter recreation opportunities. The Stonewall Vegetation Project is not a travel planning project and does not propose to change the permanent road system in the project area. Travel management of existing routes is addressed in the "Blackfoot-North Divide Winter Travel Plan" (2014) and the "Blackfoot Non-Winter Travel Plan" (2015) analyses.

A few responses included items of literature to be considered, some noted as opposing science information. As part of the analysis for this project, resource specialists reviewed and considered relevant scientific literature, including submitted articles. The literature review is included in the project record and available on the forest website www.fs.usda.gov/helena/.

Using the comments from the public, and other agencies the interdisciplinary team developed a list of issues to address.

The Notice of Availability of the DEIS was published in the *Federal Register* on May 3, 2013 (78 FR 26027). The Notice of Availability started the 45-day comment period on the DEIS. We sent about 240 letters and electronic mail attachments announcing the availability of the DEIS to interested and affected individuals, groups and agencies on April 30, 2013. A legal notice announcing the opportunity to comment on the Stonewall Vegetation Project DEIS was published in the Helena Independent Record on May 6, 2013.

Appendix A of this FEIS lists the names of the individuals, organizations, and agencies that provided comments during the opportunity to comment period for the DEIS for the Stonewall Vegetation Project, on the Helena National Forest. Appendix A includes a copy of the letters received commenting on the DEIS, followed by the Forest Service response.

Issues

All of the comments received as a result of scoping and meetings were reviewed by the interdisciplinary team and responsible official and used to identify those which may have a significant cause-effect relationship with the proposal. Specialists analyzed effects in their reports comparing trade-offs for the decision-maker and public to understand. These issues were used to:

- ♦ Formulate alternatives
- ♦ Prescribe specific design feature to reduce undesired effects
- ♦ Provide clarification in specialist reports or evaluate the comparative merits of the effects of alternatives

Formulate Alternatives

These are issues regarding the action and its effects on a particular resource or group of resources that are unresolved or renders the action less effective in accomplishing the purpose and need for this project.

Wildlife Habitat: Proposed vegetative removal and burning treatments may reduce the quality change structure and composition of vegetation or availability of habitat for threatened, endangered and sensitive species and designated critical habitat; management indicator species (MIS); big game hiding cover, thermal cover, and security cover. The public expressed concern with fragmentation of habitat from roads (habitat connectivity) and viability of old-growth and snag-dependent species.

Indicators:

- · Changes in grizzly bear security cover and potential conflicts with humans. Core habitat, Open Road Density (ORD) and Total Road Density (TRD) are specific measures used to evaluate changes within the grizzly bear management units (Arrastra and Red Mountain sub units) that overlap the project area
- · Habitat suitability changes within the Lynx Analysis Units (LAUs BL-7 and BL-8) Acres of lynx habitat affected is evaluated according to the Northern Rocky Mountain Lynx Management Direction (NRMLMD) standards and guidelines.
- · Changes in availability of the number of snags and tons of downed woody debris
- · Acres of suitable MIS and sensitive species habitat impacted
- · Acres of elk hiding cover, thermal cover, and security habitat within the project area and elk herd units
- · Maintaining or providing habitat connectivity
- · Acres of old growth affected and effects to snag-dependent species

Addressed by Design Features or Evaluated for Comparison

In addition to the issue identified above, we analyzed the effects of the proposed action and alternatives based on implementing design criteria, and disclose the differences of effects between alternatives for the following:

40-Acre Opening Limit: Proposed regeneration harvest units exceed 40 acres in seven units (appendix L). All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size

Weed Spread/Infestation: Proposed actions, including harvest disturbance and use of haul routes in areas with weeds present, may disturb landscapes allowing existing weed populations to expand or allowing additional species to become established.

Treatment of existing weed infestations would occur under the guidance of the Forest-wide effort and treatments to prevent the spread of weeds is included in design features to reduce potential spread.

Use of roads that would be built then obliterated immediately following timber removal, and use of existing roads: Comments indicated concern that roads built then obliterated immediately following timber removal, road reconstruction, and use of existing roads would adversely impact soils through compaction, water quality and fisheries through sedimentation, and associated wildlife habitat.

Amount of Prescribed Fire: Concern that the Forest Service has limited experience implementing prescribed fire in mixed-severity fire regimes. Concern with the amount of acres proposed for prescribed burning; proximity to private land and timing of burns introduce risk to private lands (e.g., loss of homes, buildings, smoke effects to air quality).

Pretreating areas with vegetation removal adjacent to private land boundaries is designed to remove potential fuels prior to prescribed burning. Pile burning is proposed to more closely manage areas to receive active burning.

The issues led the agency to develop alternatives to the proposed action.

Alternatives Considered in Detail

Alternative 1 - No Action

Under the no-action alternative, current management plans would continue to guide management of the project area. No timber removal, fuels reduction, or prescribed burning for forest restoration would be implemented to accomplish project goals.

Alternative 2 - The Proposed Action

This alternative represents the proposed action from scoping. Mapping corrections resulted in slight adjustments in acre and mile figures from scoping.

Alternative 2 proposes a total of 8,564 acres of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 3,099 acres. Proposed regeneration harvest units exceed 40 acres in seven units. All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size (See also Appendix B, page 224). Fuels treatments would follow timber removals, including slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is proposed within the inventoried roadless areas (IRAs) to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 4,182 acres (about 0.5 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Area and on 664 acres (about 3.8 percent) within the Lincoln Gulch Inventoried Roadless Area. To help facilitate management, outside these IRAs approximately 2.6 miles of road would be built then obliterated immediately following timber removal.

Alternative 3

This alternative was developed to address issues raised during scoping regarding reducing potential impacts to habitat for threatened, endangered and sensitive species and designated critical habitat; management indicator species (MIS); big game hiding cover, thermal cover, and security cover. Treatments were reviewed and adjusted to reduce impacts to habitat (figure 14).

Alternative 3 proposes a total of 6,564 acres of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 2,298 acres. Proposed regeneration harvest units exceed 40 acres in seven units (appendix L). All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size (See also Appendix B, page 230). Fuels treatments would follow timber removals and include slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is proposed within the Bear Marshall Scapegoat Swan Inventoried Roadless Area to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 3,565 acres (about 0.4 percent) within the Bear Marshall Scapegoat Swan IRA. The Lincoln Gulch IRA would not be treated. To help facilitate management, outside these IRAs approximately 0.4 mile of road would be built then obliterated immediately following timber removal.

Alternatives at a Glance

Table S- 1. Acres of proposed harvest and fuels treatments by alternative

GROUP #: BRIEF TREATMENT DESCRIPTION HARVEST TREATMENT, FUELS TREATMENT	**ALT. 1 NO ACTION ACRES**	**ALT. 2 ACRES**	**ALT. 3 ACRES**
Group 1: Intermediate Harvest to Promote Mature Open Forests	**0**	**974**	**232**
Improvement Cut, Jackpot Burn	0	36	0
Improvement Cut, Underburn	0	938	232
Group 2: Intermediate Harvest to Thin Young Forests	**0**	**1,132**	**822**
Precommercial Thin	0	523	409
Precommercial Thin, Handpile Underburn	0	0	29
Precommercial Thin, Handpiling, Burn Piles	0	78	50
Precommercial Thin, Underburn	0	289	141
Precommercial Thin, Underburn or Slash Treatment along PVT	0	242	193
Group 3: Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees	**0**	**745**	**664**
Seedtree with Reserves, Broadcast Burn	0	29	29
Seedtree with Reserves, Jackpot Burn	0	73	41
Seedtree with Reserves, Slashing, Handpiling, Burn Piles	0	18	18
Seedtree with Reserves, Underburn	0	223	207
Shelterwood (Group) with Reserves, Jackpot Burn	0	137	137
Shelterwood (Group) with Reserves, Site Prep Burn	0	96	96
Shelterwood (Group) with Reserves, Slashing, Handpile/Burn	0	25	0
Shelterwood (Group) with Reserves, Underburn	0	114	114
Shelterwood with Reserves, Site Prep Burn	0	30	22
Group 4: Regeneration Harvest in Areas of High Mortality	**0**	**223**	**152**

GROUP #: BRIEF TREATMENT DESCRIPTION HARVEST TREATMENT, FUELS TREATMENT	**ALT. 1 NO ACTION ACRES**	**ALT. 2 ACRES**	**ALT. 3 ACRES**
Retaining Rare Live Trees			
Clearcut with Reserves, Broadcast Burn	0	98	80
Clearcut with Reserves, Jackpot Burn	0	53	0
Clearcut with Reserves, Site Prep Burn	0	54	54
Clearcut with Reserves, Underburn	0	18	18
Group 5: Intermediate Harvest to Remove Minor Amounts of Dead/Dying Trees	**0**	**25**	**25**
Sanitation, Slashing, Handpiling, Burn Piles	0	25	25
Total Harvest Treatments (acres)	**0**	**3,099**	**1,895**
Group 6: Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 acres	**0**	**449**	**326**
Low Severity Fire, Openings <5 acres	0	326	326
Low Severity Fire, Openings <10 acres	0	123	0
Group 7: Mixed Severity Fire to create mortality patches up to 5, 10, or 20 acres	**0**	**410**	**36**
Mixed Severity Fire, Openings <5 acres	0	36	36
Mixed Severity Fire, Openings <10 acres	0	48	0
Mixed Severity Fire, Openings <20 acres	0	326	0
Group 8: Mixed severity fire to create mortality patches up to 30 or 75 acres	**0**	**4,604**	**3,265**
Mixed Severity Fire, Openings <30 acres	0	3371	2032
Mixed Severity Fire, Openings <75 acres	0	1233	1233
Group 9: Low Severity Prescribed Fire	**0**	**0**	**638**
Jackpot Burn	0	0	326
Underburn	0	0	312
Group 10: Intermediate Harvest to Promote Mature Open Forests	**0**	**0**	**403**
Improvement Cut and Leave, Jackpot Burn			**403**
Grand Total Project Treatments (acres)	**0**	**8,564**	**6,564**
Logging Systems			
Tractor logging (total acres)	0	1,944	1,246
Skyline logging (total acres)	0	663	364
Hand treatments Intermediate Harvest – Precommercial Thin (acres) Prescribed fire (acres)	 0 0	 493 5,463	 285 4,668
Burning Treatments			
Total area proposed for burning treatments (acres)	0	8,039	6,155
Total area proposed for burning in designated IRAs (acres)	0	4,846	3,565
Roads			
Roads Built for Project Use then Obliterated (miles)	--	2.6	0.4
Road Maintenance (miles)	--	45.6	43.8
Total Road Miles Used	--	48.2	44.2
Timber Volume (Ccf)	--	22,022	14,299

In addition to the alternatives considered in detail, public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Six additional alternatives were considered, but dismissed from detailed consideration. Some of these alternatives were outside the scope of restoration, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm.

Major Conclusions Include:

- Effects related to the significant issues and project purpose and need

A brief summary of the effects as related to the significant issues and purpose and need identified for the Stonewall Vegetation Project follows in the Comparison of Alternative Effects Section.

Decision Framework

The environmental impact statement is not a decision document; it discloses the environmental consequences of implementing action alternatives or no action at this time. Based upon the effect of the alternatives, the responsible official will decide on the following main points:

- Whether or not to implement the proposed action or an alternative to the proposed action and appropriate mitigation
- What monitoring requirements are appropriate to evaluate implementation of this project
- Whether a Forest Plan amendment is necessary e.g. reductions in big game habitat

In addition to deciding whether the above activities occur, the responsible official will also choose the degree to which (if at all) activities are implemented. The final decision will be based on the information in this document and the supplementary information contained in the project record, consideration of public comments, how well the selected alternative meets the purpose and need for the project and whether the selected alternative complies with agency policy, applicable State and Federal laws, and Forest Plan direction.

Preferred Alternative

Alternative 3 is the Preferred Alternative. This alternative was developed to address issues raised during scoping regarding reducing potential impacts to habitat for threatened, endangered and sensitive species and designated critical habitat; management indicator species (MIS); big game hiding cover, thermal cover, and security cover. Treatments were reviewed and adjusted to reduce impacts to habitat.

Comparison of Alternative Effects

This section provides a summary of the effects of implementing each alternative.

Vegetation

Vegetative conditions within the project area are described in chapter 1 and chapter 3. Proposed treatments address the purpose and need of the project. Following is a summary of the vegetative effects

Purpose and Need: Enhance and Restore Aspen, western larch, and ponderosa pine species and habitats

Whether a treatment would result in an increase in a particular tree species depends upon the type of treatment, the characteristics of the tree species, and the current presence of the tree species in the area receiving the treatment. Treatments vary widely in the opportunity they provide to manipulate the presence of a particular species. Intermediate treatments provide a great deal of control through tree selection preferences applied during thinning if the tree species is present and regeneration treatments provide a great deal of control through control of seed sources and planting of preferred species. Prescribe burns provide opportunities to increase fire-tolerant or shade-intolerant early seral species such as ponderosa pine, western larch, and quaking aspen through killing competing fire-intolerant species and through creating open areas for regeneration although the degree of control is not great simply due to the variable nature of prescribed burning.

The effects of the three alternatives upon within-stand tree species compositions by treatment group and as a proportion of the landscape are displayed in chapter 3 **(**Table 29**. Alternative comparisons for ponderosa pine, western larch, whitebark pine, and aspen)**.

Alternative 1 would continue the current condition in which the four species have declined in presence within stands and upon the landscape due to succession and the recent mountain pine beetle epidemic. In the long term, those four species would continue to decline as succession continues. Alternatives 2 and 3 would result in an increase in the presence of all four species, with alternative 2 leading to the greatest increase due to the greater treatment area involved, and the greater area in regeneration and intermediate treatments which have the greatest potential for modifying species composition at the stand level.

Purpose and Need: Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects

The expected effects of the three alternatives on within-stand species compositions are displayed in chapter 3 **(**Table 30**. Alternative comparisons for stand structures).**

Under alternative 1, the current condition would persist, and the general track of tree species on the landscape would be toward increases in Douglas-fir, subalpine fir, and Engelmann spruce and decreases in the early seral species—ponderosa pine, quaking aspen, western larch, whitebark pine, and lodgepole pine. Lodgepole pine would regenerate in many areas in which it was a major component before the mountain pine beetle epidemic, becoming a component in mixed-species stands with Douglas-fir, Engelmann spruce, and subalpine fir. Treatments in both alternatives 2 and 3 would modify the current condition and increase ponderosa pine, western larch, quaking aspen, and whitebark pine as discussed above. Both alternatives would improve the mix of tree species in treated areas, resulting in tree species mixtures that would be more diverse and resilient. Alternative 2 would result in greater effects than Alternative 3 due to the greater acreage treated, and the greater acreage treated with intermediate and regeneration treatments.

The effects of the three alternatives on stand structures in terms of tree diameter distributions for proposed treatment type groups are displayed in chapter 3 **(**Table 30**. Alternative comparisons for stand structures)**.

Alternative 1 would continue the current condition in the short term and long term; stand understories would become denser and the stands more closed. Stand diameter distributions would remain the same in the short term and in the long term would tend to become more steeply weighted toward smaller diameters due to ingrowth and natural mortality of the larger diameter classes. Treatments in both alternatives 2 and 3 would modify the track that the stands are on with the degree and nature of the effects depending upon the type of treatment. Intermediate harvests (Groups 1 and 10) would "flatten" the diameter distributions by thinning small and mid-sized trees while retaining the largest trees—creating open multi-story structures. Precommercial thinning (Group 2) would create open, single-story stands by pre-commercially thinning even-aged, closed, single-story plantations. Regeneration treatments (Groups 3 and 4) would create even-aged stands with a small number of older and larger trees present as seed sources, shelter, or retention trees. Removing dead and dying trees and slashing undesirable understory trees (Group 5) would create stands that are open and almost single-story. Low-intensity prescribed burns (Groups 6 and 9) would flatten the diameter distributions due to killing many of the smaller diameter trees and would create stands that are more open and still multi-story. Mixed-severity prescribed burns (Groups 7 and 8) would create areas that are mosaics of structures including open and closed single-story, open and closed multi-story, and early-seral grass/forb/shrub openings. The effects of all treatments would last into the long term but eventually the stands would become more closed and multi-story as trees grow and as the stand understories fill in.

The effects of the three alternatives on stand structures at the landscape level by comparing the proportion of change within Biophysical Setting/vegetation fuel class combinations are displayed in chapter 3 (Table 31**. Alternative comparisons for landscape-level stand structures).**

Under alternative 1 in the short term the current condition would persist, which in general is below desired in (1) early seral and mid-seral open for all biophysical settings, (2) mid-seral closed in the two subalpine fir biophysical settings, and (3) in late-seral open for the two Douglas-fir and the ponderosa pine/Douglas-fir Biophysical Settings. Vegetation-fuel classes are above desired in all other combinations. Long-term trends under Alternative 1 would be: decreasing early seral, mid-seral closed, mid-seral open, and late-seral open in almost all biophysical settings due to tree growth and filling in of stand understories. Both alternative 2 and alternative 3 would: (1) increase area in early seral for all BpS, (2) decrease area in mid-seral closed for all BpS, (3) increase area in mid-seral open for all but upper subalpine BpS, (4) increase area in late-seral open for all BpS, and (5) decrease area in late-seral closed in all Bps. Alternative 2 would bring about greater change than alternative 3 due largely to the greater acreage treated. Both alternatives 2 and 3 would move the vegetation-fuel classes toward the reference condition, but largely due to the small portion of the analysis area proposed for treatment there would still be relatively great differences between present and reference condition for many BpS/vegetation-fuel class combinations.

Purpose and Need: Forest health in terms of reduced susceptibility (increased resistance) of individual stands and the landscape to diseases and insects found within the project area of concern

In chapter 3 (Table 32. **Alternative comparison for insects and diseases)**, we compare the three alternatives in terms of susceptibility to several insects and diseases that are impacting stands in the project area

Under alternative 1, in the short term there would be little change from the current condition, which in general is (1) low and long-term decreasing risk for those insects and diseases dependent upon early seral trees such as the pines (e.g., mountain pine beetle), (2) higher and long-term increasing risk and impacts from those dependent upon Douglas-fir, subalpine fir, and Engelmann spruce, and (3) relatively low but long-term increase in susceptibility to armillaria which affects all conifers but for which pines and western larch are more resistant than the other conifers. Both alternatives 2 and 3 would generally reduce susceptibility to insects and diseases in treated stands and on the landscape. Exceptions to this would be white pine blister rust, for which we cannot say that the treatments would directly reduce the disease and Douglas-fir beetle for which the prescribed burning may increase risk in the treated areas to a small degree and short period of time. Over the landscape, both alternatives would increase resistance to insects and diseases by increasing tree species diversity and age class diversity, reducing stocking and so increasing individual tree resistance, and modifying structures. Alternative 2 would reduce susceptibility to a greater degree than alternative 3, largely because a greater area is being treated.

Transportation

Under the no-action alternative, no changes would be made to the existing transportation network on and adjacent to the project area. There would be no changes to effects or impacts on the project transportation network.

Alternatives 2 and 3 would use approximately 48.2 and 44.3 miles, respectively, of roads would access vegetation treatment units and connect with Montana State Highway 200. Existing roads would serve as project access and haul routes on nearly 45.6 miles under alternative 2 and 44.3 miles under alternative 3. Under alternative 2 another 2.6 miles of new roads would be constructed to access treatment units. Under alternative 3 approximately 0.4 mile of road would be built then obliterated immediately following timber removal. These roads would be closed (e.g., gates, barricades) during operations to limit use to operators only, and obliterated or rehabilitated immediately following vegetation treatments.

Cumulative effects of past, present, and foreseeable actions are expected to have minor impacts on the project transportation network. Project haul routes would be maintained and improved in accordance with BMPs to accommodate haul vehicles. Sediment sites would be mitigated to reduce long-term sediment delivery. Annual road maintenance activities would also occur on National Forest System roads and also on adjacent State and private roads.

Fire and Fuels

The mechanical treatments proposed would reduce surface fuels, raise canopy base heights by reducing ladder fuels and stand density, resulting in modified fire behavior potential. The result would be safer, more efficient and direct initial attack of unwanted fires by fire suppression forces.

The prescribed burn treatments would reduce fuels and break up contiguous vegetation to create a heterogeneous fuelscape so that areas with high fire behavior potential are interspersed with areas of mixed and low fire behavior potential, thereby limiting the potential for high-intensity crown fire to spread towards the WUI. Fire management has evolved over time and fire managers look for opportunities to manage fire for multiple objectives. Reintroducing fire to the landscape and allowing it to occur as a natural process is desired in order to move the landscape toward the desired condition as outlined in the LRMP.

The Stonewall Vegetation Project would be important to the success of future fire suppression efforts and complements past treatments and those currently occurring or being proposed on adjacent federal, state and private lands.

The following analysis issues or concerns were identified for this project during the scoping period. The alternatives will address the issues as follows.

1. Wildland Fire and Homes: Proposed treatments may be inefficient and ineffective in reducing home losses due to fire.

Proposed treatments would reduce surface, ladder and crown fuels and change the fuel model profile, thereby decreasing the area with potential for flame lengths greater than four feet and reducing potential crown fire risk. In addition, alternative 2 or 3 would reduce the risk of wildfire impacts to adjacent private lands and other resource values. By treating these areas, they become more resilient to stand-replacing wildfire and allow greater protection within the WUI zone.

2. Fire Behavior: Proposed fuels reduction work would not reduce fire behavior.

Fire modeling suggests the proposed treatments would effectively reduce fire behavior. Following implementation of a chosen alternative, the treated areas should exhibit surface fire under the modeled conditions, making fire suppression efforts safer and more effective. With these alternatives, desired fuel loadings and fire behavior characteristics would be achieved and natural or prescribed fire could occur with less risk.

3. Prescribed Burning: Concerns over risk of fire escaping burn boundaries during prescribed burning operations.

All prescribed burning would occur when weather and fuel conditions are favorable. All burning would take place under the guidelines in the prescribed fire burn plan developed specifically for project-related burning activities. Prescribed burn plans address parameters for weather, air quality, contingency resources and potential escapes.

Air Quality

Wildfires are known to result in high levels of emissions and associated National Ambient Air Quality Standards (NAAQS) violation and worst visibility. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems. According to (Wiedinmyer and Hurteau 2010) wide-scale prescribed fire application can reduce CO2 fire emissions for the western US by 18 to 25 percent. The total amount of pollutants released by prescribed burning under alternative 2 and 3 would be spread out over several years and would occur when emissions would be unlikely to have significant adverse effects on human health and visibility. After implementation, it is estimated that subsequent wildfires in the project area could produce less pollutants due to less fuel available to burn.

All prescribed burning would be implemented in full compliance with Montana Department of Environmental Quality (MDEQ) air program with coordination through the Montana/Idaho Airshed Group. All action alternatives would meet Forest Plan Standards for air quality by following coordination requirements. The project complies with the Federal Clean Air Act.

Habitats of Special Concern

Snags

The forested landscape will experience additional bark beetle mortality from the ongoing mountain pine beetle (MPB) epidemic. The levels of additional mortality are a matter of speculation, but available research indicates that mountain pine beetle epidemics continue until the available bark beetle habitat is sufficiently reduced that epidemic levels can no longer be sustained (Cole and Amman 1969, Cole and Amman 1980, Klein et al. 1978, Mitchell and Preisler 1991). Mountain pine beetles strongly favor infesting the trees of larger diameter each year and over the life of the infestation infesting smaller trees each year until the average host tree diameter declines to a point that the tree habitat cannot produce sufficient numbers of beetles to maintain the outbreak (Cole and Amman 1969, Cole and Amman 1980). The outbreaks are relatively short, lasting about 6 years (Cole and Amman 1969, Cole and Amman 1980). Given the magnitude of the mortality that has occurred in the project area as of the writing of this report, we suspect that the epidemic is declining.

The lodgepole pine snags would start falling in 3 to 5 years after death (Bull 1983, Mitchell and Preisler 1998). Snag fall rates depend on tree species, tree size, cause of death, and environmental conditions that could affect the speed of bole decay (Bull 1983, Mitchell and Preisler 1998). For lodgepole pine, Bull (1983) found that 8 years after death about 75 percent of the snags less than 25 cm had fallen and 42 percent of the snags greater than 25 cm had fallen. Mitchell and Preisler (1998), in their study of mountain pine beetle-killed snags in Oregon, found that tree size was not a factor in unthinned stands and that in unthinned stands, 50 percent were down in 9 years and 90 percent were down in 14 years.

In the short term, snag numbers would be very high, but in the long term, snag numbers would decline greatly as the lodgepole pine snags fall down.

As discussed and displayed above, given the recent mountain pine beetle epidemic, snags in the project area are abundant and far exceed forest plan requirements. Under alternative 2, the intermediate and regeneration treatments would reduce snag levels to the forest plan requirements within the treatment units and the mixed-severity prescribed burns would increase snag levels within the burn units. After the treatments are done, snag levels would slightly decrease in the 3rd-order drainage 0203, slightly increase in the 3rd-order drainage 0204A, and slightly increase in the project area. They would still exceed 19 times the forest plan requirements. Under alternative 3, the intermediate and regeneration treatments would reduce snag levels to the forest plan requirements and the prescribed burns would increase snag levels. After the treatments are done, snag levels would slightly decrease in the 3rd-order drainage 0203, slightly increase in the 3rd-order drainage 0204A, and slightly increase in the project area. They would still exceed 20 times the forest plan requirements.

Old Growth

Effects to designated old growth in the two 3rd-order drainage are the same under all alternatives because no activities are proposed in designated old growth in these drainages. Following the process described above, about five percent of each 3rd-order drainage is designated to manage as old growth. All old growth would continue to develop successionally under all alternatives. Changes would be slight in the short term, but could be substantial in the long term. Single-story and two-story stands would become more multi-story. Closed canopies would remain closed, and open stands would become closed over time. Down woody fuels would continue to accumulate.

About 63 percent of the designated old growth is Douglas-fir type. With continuing succession, more small trees would become established with the species composition trending toward subalpine fir (Fischer and Clayton 1983). These stands are susceptible to Douglas-fir beetle (DFB), western spruce budworm (WSB), and root disease. Aerial survey data appears to indicate that DFB has consistently declined in recent years, while WSB infestation was extensive in 2009, substantially less was recorded in 2010 (Amell and Higgins 2014). Douglas-fir beetle tends to infest large and old Douglas-fir and heavily stocked stands. Their impacts can also be affected by weather conditions, for example droughts that reduce host tree vigor. With increasing stocking, tree size and age over time, we can expect DFB to continue to impact the stands to some degree, increasing with the next droughty period. Since forests in the area, including the old growth stands, are progressing toward dominance by Douglas-fir and subalpine fir, we can expect the impacts of WSB to continue if not increase. Diseases would continue to impact stands at current levels.

In the long term, dense forest conditions with multiple-layer stands and increasing surface fuels would support increasingly intense fire behavior and severe fire effects (Buhl 2015). Stand-replacement fire would become more likely on the landscape and old-growth stands more susceptible to the impacts.

No designated old growth in 3rd-order drainages would be treated under any alternative. Forest Plan direction regarding old growth would be met. Under alternative 2 outside of the 3rd-order drainages, three stands (42201139, 42201147, and 42201152) that may potentially be old growth would be prescribed burned; one stand that has been verified by a recent stand exam (41502089) would be prescribed burned, and one stand that has been verified by a recent stand exam (42303103) would be thinned and prescribed burned. Under alternative 3 outside of the 3rd-order drainages, one stand that has been verified by a recent stand exam (41502089) would be prescribe burned, and one stand that has been verified by a recent stand exam (42303103) would be partially thinned and the fuels burned.

Stands proposed for treatment would be changed by the treatments, with species compositions “pushed” toward dominance by seral fire-tolerant conifers, and stand structures “pushed” to or toward open, but still multi-story, structures with relatively flat diameter distributions. Treated potential and verified old growth stands would still qualify as old growth following the treatments.

Project design feature WL-34 (table 9) would mitigate impacts to old-growth stands by minimizing mortality in larger trees to increase average stand diameter and maintain old-growth conditions.

Wildlife

Overview of Issues

The following issues were identified as a result of public scoping and used to develop alternatives to the proposed action. Also, these issues as well as other issue indicators identified to measure potential impacts to wildlife from alternatives considered in the project environmental impact statement are displayed in the following table. Effect indicators are collectively used to assess species viability or population changes.

- Restoration of vegetation communities
- Grizzly bear habitat impacts
- Elk security cover and the LRMP standard.
- Lynx habitat: Designated Critical Habitat and Stand Initiation Phase acreage
- Wildfire hazard, risk, and fuels
- Habitats including ponderosa pine, western larch and aspen: maintenance or restoration
- Road impacts to elk and grizzly bear habitat as well as disturbance factors

Species	Indicator
Threatened and Endangered Species	
Grizzly Bear	Effects to individuals and changes in security cover and potential conflicts with humans. Security Core habitat, Open Road Density (ORD) and Total Road Density (TRD) are specific measures used to evaluate changes within the recovery area, whereas changes in cover and forage within and outside the NCDE are assessed.
Canada Lynx	Effects to individuals and acres of stand initiation, multi-story and mid-seral habitat affected in Lynx Analysis Units (LAUs bl-7 and bl-8). Compliance with the Northern Rocky Mountain Lynx Management Direction (NRLMD) standards and guidelines.
Wolverine	Effects to individuals and acres of natal denning and foraging habitat. Availability of remote and dispersal habitat and changes in connectivity and human access.
Sensitive Species	
Gray Wolf	Effects to individuals and changes in big game. Den, rendezvous and foraging habitat affected.
Fisher	Effects to individuals and acres of den, rest and foraging habitat. Changes in human access.
Townsend’s Big-eared Bat	Effects to individuals and acres of and effect to foraging habitat.

Species	Indicator
Bald Eagle	Effects to individuals, suitable nest habitat affected, effects to reproduction and nest and foraging habitat availability.
Black-backed Woodpecker	Effects to individuals, acres of suitable habitat, changes in quality and distribution of suitable snag habitat.
Flammulated Owl	Effects to individuals and acres of suitable habitat. Short and long-term changes in the quality of suitable open-canopy habitat, availability of large diameter (>=19 inches) snags.
Western Toad	Effects to individuals, acres of breeding and upland habitat affected.
Management Indicator Species	
Northern Goshawk	Effects to individuals and reproduction. Acres of nest and foraging habitat, nest, foraging and post-fledgling habitat affected, landscape level changes in habitat. Ability of the project area to support nesting pairs.
Pileated Woodpecker	Effects to individuals and reproduction. Acres of old growth habitat, existing and affected suitable habitat, changes in quality of foraging and nesting habitat, large snag (>=20 inches d.b.h.) availability and changes in project area distribution and use.
Hairy Woodpecker	Effects to individuals and reproduction, acres of suitable habitat, acres of suitable habitat affected, changes in quality of suitable habitat, snag (all size classes) availability. Changes in project area distribution and use
American Marten	Effects to individuals and reproduction. Existing and affected suitable habitat. Changes in the quality of den and foraging habitat, project area distribution and use, and snag and downed woody debris (DWD) availability.
Commonly Hunted Species	
Elk	Acres of hiding and thermal cover, habitat effectiveness, acres of security habitat, changes in access and mortality, acres of foraging habitat, and compliance with the Montana logging study. Changes in hunting opportunity.
Mule Deer	Acres of hiding and thermal cover, acres of foraging habitat, changes in project area distribution and use and hunting opportunities.
Migratory Species	
Migratory Birds	Changes (acres) in available habitat (Biophysical settings), compliance with MBTA.

Effects Determinations

Effects determinations for wildlife species by alternative are displayed in the following table

Species	Alternative 1	Alternative 2	Alternative 3
Threatened and Endangered Species			
Grizzly Bear	The risk of stand-replacing wildfire remains high, but no direct effects are anticipated and in the absence of wildfire, grizzly habitat would be largely unchanged. Because whitebark pine would likely continue to decline, implementation of alternative 1 **may affect but is not likely to adversely affect** grizzly bear.	Improve landscape-level foraging habitat, maintain whitebark pine, results in short- and long-term reductions in cover and increase the risk of bear/human interaction. Overall project implementation is not anticipated to adversely affect grizzly bears. However, due to the current degraded baseline of the Red Mountain subunit it is the determination of the analysis that short-term road use within the subunit for implementation of alternative 2 **may affect, likely to adversely affect** grizzly bear.	Improve landscape-level foraging habitat, maintain whitebark pine, results in short- and long-term reductions in cover and increase the risk of bear/human interaction. Overall project implementation is not anticipated to adversely affect grizzly bears. However, due to the current degraded baseline of the Red Mountain subunit it is the determination of the analysis that short-term road use within the subunit for implementation of alternative 3 **may affect, likely to adversely affect** grizzly bear.
Canada Lynx	The risk of wildfire remains high, however, because there are no direct effects and considering winter foraging and den habitat remains largely unchanged, implementation of alternative 1 **may affect, not likely to adversely affect** Canada lynx.	All treatments fall within the WUI, meet exceptions for VEG S5 and VEG S6, and comply with VEG G10. Treatments comply with VEG S1 and VEG S2, and fuel treatment projects that do not meet VEG S1, VEG S2, VEG S5 and VEG S6 occur on less than 6 percent of the available habitat on the Helena Forest. Proposed treatments comply with Northern Rockies Lynx Management Direction (USDA Forest Service 2007b), and there are no effects anticipated that were not considered in the BO (USDI Fish and Wildlife Service 2007b). As a result implementation of alternative 2 **may affect, likely to adversely affect** Canada lynx.	All treatments fall within the WUI, meet exceptions for VEG S5 and VEG S6, and comply with VEG G10. Treatments comply with VEG S1 and VEG S2, and fuel treatment projects that do not meet VEG S1, VEG S2, VEG S5 and VEG S6 occur on less than 6 percent of the available habitat on the Helena Forest. Proposed treatments comply with Northern Rockies Lynx Management Direction (USDA Forest Service 2007b), and there are no effects anticipated that were not considered in the BO (USDI Fish and Wildlife Service 2007b). As a result implementation of alternative 3 **may affect, likely to adversely affect** Canada lynx.
Canada Lynx Critical Habitat	**No effect.**	All treatments are consistent with the NRLMD (USDA Forest Service 2007b). While some treatments within winter foraging habitat would occur within the WUI, treatments were designed	All treatments are consistent with the NRLMD (USDA Forest Service 2007b). While some treatments within winter foraging habitat would occur within the WUI, treatments were designed

Species	Alternative 1	Alternative 2	Alternative 3
		considering standards to promote lynx conservation and collectively application of the standards for vegetation management are expected to avoid adverse effects to lynx (USDI Fish and Wildlife Service 2007b p. 43). **May affect, likely to adversely affect Critical Habitat**	considering standards to promote lynx conservation and collectively application of the standards for vegetation management are expected to avoid adverse effects to lynx (USDI Fish and Wildlife Service 2007b p. 43). **May affect, likely to adversely affect Critical Habitat**
Sensitive and Federal Candidate Species			
Wolverine	Although recent fires have reduced wolverine foraging and den habitat, suitable habitat would continue to be available. While the risk of future wildlife is greatest under this alternative, there is no way to predict if or when wildfire would occur. As a result and based on the above analysis and the following rationale, implementation of alternative 1 would **no impact** upon wolverine.	The Stonewall project was analyzed for effects to wolverines based on vegetation changes, movements across the landscape, and the distribution from human activities associated with the project. Based on the analysis provided and the following rationale, it is determined that implementation of the Stonewall Veg Management Project **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**	The Stonewall project was analyzed for effects to wolverines based on vegetation changes, movements across the landscape, and the distribution from human activities associated with the project. Based on the analysis provided and the following rationale, it is determined that implementation of the Stonewall Vegetation Management Project **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**
Gray Wolf	Suitable wolf habitat, including remote areas for denning and big game populations would remain largely unchanged. As a result, and considering that human use and access is not expected to increase, implementation of alternative 1 would have **no impact** on wolves.	No known den or rendezvous sites would be affected. Disturbance to foraging wolves during implementation could occur, but would involve short-term disturbance during implementation. Big game populations and wolf foraging opportunities would be maintained in the short term and increased in the long term. The likelihood of stand-replacing wildfire is lowest under this alternative. Alternative 2 has the potential for short-term impacts to foraging or dispersing wolves. However, based on the analysis and the above rationale, implementation of alternative 2 **May**	No known den or rendezvous sites would be affected. Disturbance to foraging wolves during implementation could occur, but would involve short-term disturbance during implementation. Big game populations and wolf foraging opportunities would be maintained in the short term and increased in the long term. The likelihood of stand-replacing wildfire would be reduced across the landscape, but at a reduced level from that of alternative 2. Alternative 3 has the potential for short-term impacts to foraging or dispersing wolves. However, based on the analysis and the above rationale, implementation

Species	Alternative 1	Alternative 2	Alternative 3
		Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.	of alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**
Fisher	Suitable habitat would be largely maintained. Risk of stand-replacing wildfire is greatest under this alternative. Because there are no direct effects anticipated and considering suitable fisher habitat would remain relatively unchanged, implementation of alternative 1 would have **no impact** on fisher.	Approximately 88 percent of the existing suitable habitat would be maintained. Preferred riparian habitat and travel corridors as well as prey availability would be maintained and the risk of stand-replacing wildfire is lowest under this alternative. The action alternatives would reduce fisher habitat by 11 to 12 percent and alter the structural conditions on approximately 38 percent of the existing fisher habitat. Based on the above analysis and the following rationale, implementation of alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**	Approximately 91 percent of the existing suitable habitat would be maintained. Preferred riparian habitat and travel corridors as well as prey availability would be maintained and the risk of stand-replacing wildfire would be reduced under this alternative when compared to no action. The action alternatives would reduce fisher habitat by 9 to 10 percent and alter the structural conditions on approximately 24 to 25 percent of the existing fisher habitat. Based on the above analysis and the following rationale, implementation of alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**
Townsend's Big-eared Bat	**No impact.** Hibernacula, swarming and roost habitat would not be affected and foraging habitat would be largely unchanged. The risk of stand-replacing wildfire is highest under this alternative.	The action alternatives would affect suitable habitat on 35 percent of the project area. Based on the above analysis and the following rationale, implementation of alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Hibernacula, swarming and roost habitat would not be affected A total of 8,562 acres of suitable foraging habitat would be affected by treatment. No	The action alternatives would affect suitable habitat on 27 percent of the project area. Based on the above analysis and the following rationale, implementation of alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Hibernacula, swarming and roost habitat would not be affected. A total of 6,562 acres of suitable foraging habitat would be affected by treatment. No mortality is anticipated although

Species	Alternative 1	Alternative 2	Alternative 3
		mortality is anticipated although short-term disturbance from smoke to foraging bats could occur. Available foraging habitat would be widespread and the risk of stand-replacing wildfire is lowest under this alternative.	short-term disturbance from smoke to foraging bats could occur. Available foraging habitat would be widespread and the risk of stand-replacing wildfire is reduced under this alternative.
Bald Eagle	**No impact.** No anticipated impacts to the existing eagle nest, although the risk of wildfire is highest under this alternative.	Existing habitat in the project area habitat would be largely unaffected. As a result alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** No direct effects to nesting birds or reproduction anticipated. Approximately 100 acres of potentially suitable nest habitat would be reduced. Foraging habitat would not be treated, although short-term disturbance to foraging birds could occur. Untreated nest and foraging habitat would continue to be widely available. Risks of wildfire are lowest under this alternative.	Existing habitat in the project area habitat would be largely unaffected. As a result alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** No direct effects to nesting birds or reproduction anticipated. Approximately 100 acres of potentially suitable nest habitat would be reduced. Foraging habitat would not be treated, although short-term disturbance to foraging birds could occur. Untreated nest and foraging habitat would continue to be widely available. Risks of wildfire would be reduced when compared to no action.
Black-backed Woodpecker	**No impact.** Suitable BBW habitat would continue to be widely available across the Forest.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable BBW habitat would continue to be widely available across the Forest.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable BBW habitat would continue to be widely available across the Forest.
Flammulated Owl	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable flammulated owl habitat would continue to decline under this alternative. While large diameter nest	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Owl habitat would be restored or created on almost 4,200 acres or 31 percent of the dry forest community.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Owl habitat would be restored or created on almost 2,800 acres or 21 percent of the dry forest community. Treatments

Species	Alternative 1	Alternative 2	Alternative 3
	trees would increase in the short term, availability would decline over the long term. The likelihood of high intensity wildfire is greatest under this alternative.	Treatments would promote ponderosa pine and potential nest trees across the landscape and the likelihood of stand-replacing wildfire is lowest under this alternative.	would promote ponderosa pine and potential nest trees across the landscape and reduce the likelihood of stand-replacing wildfire when compared to no action.
Western Toad	**No impact.** Western boreal toads and their habitat would not be affected. The risk of stand-replacing wildfire and a long-term reduction in breeding and upland habitat is highest under this alternative.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable habitat would continue to occur on sites treated and long-term foraging habitat would be improved. The likelihood of impacts to breeding and upland habitat from high severity wildfire is lowest under this alternative.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable habitat would continue to occur on sites treated and long-term foraging habitat would be improved. The likelihood of impacts to breeding and upland habitat from high severity wildfire would be reduced when compared to no action.
Management Indicator Species			
Northern Goshawk	**Not likely to cause a local or regional change in habitat quality or population status**. Suitable nest habitat would increase, although landscape diversity associated with foraging and post-fledging habitat would be largely unchanged. Risk of stand-replacing wildfire and a reduction in suitable nest habitat is highest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status.** Suitable nest, forage and PFA habitat would occur in all affected drainages and landscape conditions resulting from treatment are consistent with goshawk use. The risk of stand-replacing wildfire and a reduction in suitable habitat is lowest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status.** Suitable nest, forage and PFA habitat would occur in all affected drainages and landscape conditions resulting from treatment are consistent with goshawk use. The risk of stand-replacing wildfire and a reduction in suitable habitat would be reduced.
Pileated Woodpecker and Hairy Woodpecker	**Not likely to cause a local or regional change in habitat quality or population status** for the pileated or hairy woodpeckers. Suitable snags and nesting and foraging habitat would be maintained and continue to be widely available.	**Not likely to cause a local or regional change in habitat quality or population status** for the pileated or hairy woodpeckers. A long-term reduction in habitat would occur on 540 acres, whereas the quality of suitable habitat would be reduced for 10 to 20 years on 2,666 acres. Over the long term, restoration of open grown ponderosa pine and western larch may improve habitat on 5,700 acres and the risk of stand-	**Not likely to cause a local or regional change in habitat quality or population status** for the pileated or hairy woodpeckers. A long-term reduction in habitat would occur on 200 acres, whereas the quality of suitable habitat would be reduced for 10 to 20 years on 1,920 acres. Over the long term, restoration of open grown ponderosa pine and western larch may improve habitat on 4,500 acres and the risk of stand-replacing wildfire Is reduced

Species	Alternative 1	Alternative 2	Alternative 3
		replacing wildfire Is lowest under this alternative.	under this alternative.
American Marten	**Not likely to cause a local or regional change in habitat quality or population status.** Existing habitat would be maintained. The risk of stand-replacing wildfire is highest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status.** Treatments would improve species and landscape diversity, and maintain 93 percent of the suitable habitat over the long-term. Also the risk of stand-replacing wildfire is lowest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status**. Treatments would improve species and landscape diversity, and maintain 96 percent of the suitable habitat over the long term. The risk of stand-replacing wildfire is reduced under this alternative.
Commonly Hunted Species			
Elk	In the Beaver Creek unit hiding cover would continue to be available to meet the 50 percent level of Forest Plan standard 3. Due to the effects of the 2003 Snow Talon fire, the Keep Cool unit is below and would continue to be below the 50 percent level of Forest Plan standard 3. With continued MPB mortality, hiding and thermal cover within both units would continue to decline. While forage availability may increase in some areas, due to continued fire suppression and overstocked stand conditions, overall forage availability would continue to be low. Due to the reduced cover conditions, **neither herd unit meets Forest Plan standard 4a for big game security.** Cover would continue to decline, however, it is expected that available habitat would continue to support desired levels of elk. Finally, due to increased fuel loading, the risk of a long-term loss of cover from stand-replacing wildfire is greatest under this alternative. Herd numbers would be largely	Treatments proposed under alternative 2 would reduce elk hiding and thermal cover in both herd units, whereas the amount and distribution of forage would increase. **Neither herd unit would meet Forest Plan standard 3 or 4a. This alternative would require a site-specific, non-significant forest plan amendment for standards 3 and 4(a) for the reductions in elk hiding cover and thermal cover, as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3.** Hunting opportunities would be maintained and based on the analysis presented above and the following rationale, adequate elk habitat would continue to be available within both units to support desired levels of elk. · Implementation would result in both short- and long-term increases in available forage on approximately eleven percent of the combined herd units, including increases on summer, transition and winter range. The increase in	Treatments proposed under alternative 3 would reduce elk hiding and thermal cover in both herd units, whereas the amount and distribution of forage would increase. **Neither herd unit would meet Forest Plan standard 3 or 4a. This alternative would require a site-specific, non-significant forest plan amendment for standards 3 and 4(a) for the reductions in elk hiding cover and thermal cover, as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3.** Hunting opportunities would be maintained and based on the analysis presented above and the following rationale, adequate elk habitat would continue to be available within both units to support desired levels of elk. · Implementation would result in both short and long-term increases in available forage on approximately eleven percent of the combined herd units, including increases on summer, transition and winter range. The increase in forage is expected to maintain or improve herd health.

Species	Alternative 1	Alternative 2	Alternative 3
	unchanged. Effects of predation would be largely unchanged. The risk of a long-term reduction in cover from wildfire is highest under this alternative.	forage is expected to maintain or improve herd health. · There would be no increase in public access or changes to elk security habitat. · Within the combined herd units approximately 89 percent of the existing hiding cover and 86 percent of the existing thermal cover would be maintained. Cover would continue to be available within and adjacent to treatment units and across the landscape. · Past wildfires have greatly reduced project area elk habitat and much of the remaining habitat is at risk. Implementation of alternative 2 would reduce future wildfire risk. It is believed that active management is necessary to address fuel loading, species diversity and insect and disease concerns. Due to the predominance of mature forest, limited disturbance and reduced forage, some management is necessary to maintain herd health and increase elk populations within the elk management unit (MFWP 2004). Collectively, the treatments proposed under this alternative are designed to address these concerns and the long-term benefits associated with the increased forage availability and reduced wildfire risk, are believed to outweigh the risks associated with the anticipated reduction in cover.	· There would be no increase in public access or changes to elk security habitat. · Within the combined herd units, approximately 93 percent of the existing hiding cover and 86 percent of the existing winter range thermal cover would be maintained. Cover would continue to be available within and adjacent to treatment units and across the landscape. · Past wildfires have greatly reduced project area elk habitat and much of the remaining habitat is at risk. Implementation of alternative 3 would reduce future wildfire risk. It is believed that active management is necessary to address fuel loading, species diversity and insect and disease concerns. Due to the predominance of mature forest, limited disturbance and reduced forage, some management is necessary to maintain herd health and increase elk populations within the elk management unit (MFWP 2004). Collectively, the treatments proposed under this alternative are designed to address these concerns and the long-term benefits associated with the increased forage availability and reduced wildfire risk, are believed to outweigh the risks associated with the anticipated reduction in cover.
Mule Deer	Deer cover on winter, transition and summer ranges would be altered due to continued MPB mortality. Forage availability would increase somewhat	Treatments proposed under alternative 2 would reduce deer hiding and thermal cover and increase deer forage. Based on the analysis presented previously	Treatments proposed under alternative 3 would reduce deer hiding and thermal cover and increase deer forage. Based on the analysis presented previously and

Species	Alternative 1	Alternative 2	Alternative 3
	but would continue to remain low, and over the long term, herd health would not be expected to improve. Adequate forage and cover would continue to be available to support existing populations and maintain hunting opportunities.	and the following rationale, adequate cover would continue to be available to support existing populations, whereas foraging availability would increase over the short and long term. Hunting opportunities would be maintained.	the following rationale, adequate cover would continue to be available to support existing populations, whereas foraging availability would increase over the short and long term. Hunting opportunities would be maintained.
Migratory Species			
Migratory Birds	Migratory bird habitat would remain largely unchanged. This alternative complies with the MBTA.	Project design features are in place to maintain migratory bird habitat and reduce potential mortality. This alternative complies with the MBTA.	Project design features are in place to maintain migratory bird habitat and reduce potential mortality. This alternative complies with the MBTA.

Plants

Alternative 1 would have no new soil disturbing activities that would disturb sensitive plant populations. However, alternative 1 does not propose activities that modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Consequently, there remains a higher risk of a large, stand-replacing fire that could result in effects to herbaceous sensitive species habitat. Under alternative 1 whitebark pine would not increase in the short term and is expected to decline from present levels in the long term.

Alternatives 2 and 3 include soil disturbing activities with the potential to affect unknown herbaceous sensitive plant populations. Alternatives 2 and 3 address the purpose and need by proposing activities that modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Alternative 2 would affect more acres than alternative 3. The proposed actions are designed to reduce potential for stand-replacing wildfire events in the treated stands. Reducing potential for stand replacing events may reduce wildfire impacts to specific resources. Proposed activities under alternatives 2 and 3 are consistent with recommendations for restoration of whitebark pine ecosystems, and in treated areas whitebark pine would increase in the short term with the increase extending into the long term.

There are no known occurrences of herbaceous sensitive plants in the project area and there is a project design feature in place to protect whitebark pine (SIL-2); therefore, direct and indirect effects are limited. Cumulative effects are not expected to contribute to change in status or viability of sensitive plants, under any of the alternatives. No downward trend in population numbers or density, or downward trend in habitat capability that would reduce the existing distribution of any of the sensitive plant species discussed in this analysis, is expected under any of the alternatives.

Summary of determination of effects to sensitive plant species are displayed in the following table.

Species Common name	Alternative 1	Alternative 2	Alternative 3
Roundleaf orchid	MII*	MII	MII
Scalloped moonwort	MII	MII	MII
Peculiar moonwort	MII	MII	MII
Lesser yellow lady’s slipper	MII	MII	MII
Sparrow egg lady’s slipper	MII	MII	MII
Howell’s gumweed	MII	MII	MII
Hall’s rush	MII	MII	MII
Missoula phlox	MII	MII	MII
Whitebark pine	MII	MII	MII

*May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.

Noxious Weeds

While the spread of noxious weeds would continue under all alternatives, the rate of spread could potentially be faster in areas proposed for treatments, particularly areas to be thinned and burned. Potential impacts would be greatest under alternative 2 followed by alternative 3. Weed management would continue as in the past, however, activities proposed for the Stonewall Project add a layer of ground disturbance and therefore requires additional management for weeds. Areas of ground disturbance would be monitored for weed infestations and treated as appropriate, in accordance with the Helena National Forest Weed Treatment Project FEIS (USDA Forest Service 2006) and Best Management

Practices (BMPs) as specified in FSM 2080 (USDA Forest Service 2001), and the Forest Plan. Chemical weed treatment would be the primary treatment method in areas that are accessible by spray equipment. Biological control would apply in areas where the biological agents have optimal conditions for survival and expansion. In riparian areas, biological control would be emphasized where conditions for insect establishment are met. The effect of all treatment methods would be to control and contain existing and new infestations related to vegetation treatments.

Soil

The project area has a long management history that includes mining, grazing, and timber harvesting, which contributed to past ground disturbing activities that lead to the current conditions. The amount of detrimental soil disturbance in the units is mixed, but primarily is the result of past log landings and skid trails with the exception of four units that have residual effects from mining. The soils in the project area are generally coarse textured and resilient to compaction and erosion if operations take place during dry or frozen conditions. Ground cover is generally high in the project area and trending toward recovery where a thin organic layer exists. Coarse woody debris (CWD) levels also vary across units but are mostly within forest standards. There are multiple areas and units where large amounts of CWD signal a build-up of “locked-up” nutrients that are not plant or soil available.

Alternative 2 has the most proposed treatment acres, followed by alternative 3. The action alternatives would result in potentially detrimental soil disturbance. However, based on research and professional experience, the positive effects of reintroducing fire far outweigh negative potential effects from disturbing a larger acreage of land.

Watershed Resources

Primary water resource concerns stemming from this project include potential sediment conveyance to streams from project treatment units, and potential increased water yield due to removal of vegetation. Field sediment surveys identified road segments that were capable of delivering sediment to ephemeral, intermittent, or perennial stream channels. Under all project alternatives, overall reductions in sediment delivery to stream channels due to application of road BMPs and road obliteration are expected. Results suggest that under existing conditions, roughly 11 tons of sediment is delivered from roads to Lincoln, Beaver, and Keep Cool Creeks in an average year. With design features proposed in this project, sediment delivery from roads would remain one ton per year for Lincoln Creek, and reduce by about one ton each for Beaver and Keep Cool Creeks. Overall sediment delivery reduction for alternatives 2 and 3 during the project is estimated to be about 2 tons. While road improvement and road obliteration activities proposed in alternatives 2 and 3 may temporarily increase sediment delivery to stream channels, the design features proposed in this project would reduce sediment delivery to project area tributaries of the Blackfoot River over the long term, leading to improved conditions in project watersheds.

The project has the potential to increase water yield in Lincoln Creek, Beaver Creek, and Keep Cool Creek. A water yield increase above 10 to 15 percent may be of concern in that the flow increase could accelerate bank erosion. Water yield increase modeling results suggest a potential increase of 2 to 8 percent in the affected watersheds. The project, when combined with other recent past and reasonably foreseeable actions was predicted to result in a theoretical combined increase in water yield from project watersheds of about 5 percent at the confluence with the Blackfoot River. These levels are within State DEQ recommendations for TMDL and non-TMDL streams elsewhere on the Helena National Forest. If predicted water yield increases did occur, the modest additional flow would likely improve stream temperature and in-stream physical habitat, rather than cause any degradation. The project is unlikely to significantly affect the condition of riparian areas in the project area, given the 50- to 100-foot riparian no-ignition buffers in place for all action alternatives. The project is unlikely to affect the condition of any wetlands found in the project area, in that these areas would either be avoided entirely, or would be treated only by hand crews or by equipment during winter operating conditions.

In summary, the proposed project would have relatively minor impacts to water resources in the project watersheds under the action alternatives. Through implementation of design features and application of BMPs, the project alternatives would most likely reduce short- and long-term sediment delivery to stream channels, improving or maintaining water quality in the Blackfoot River headwaters watershed. Alternatives 2 and 3 would also reduce long-term sediment delivery through improving road BMPs at stream crossings. Water yield change due to proposed project activities is predicted to be at the margins of detectability and is not anticipated to have any deleterious effects on channel stability or water quality.

Fish Habitat

Alternative 1 (no action) would not promote a change in existing conditions within the analysis area. While this alternative meets the Forest Plan direction of “no measurable effect”, it does nothing to help ensure movement toward desired conditions. Because many streams are currently nonfunctioning or functioning at risk, alternative 1, when considered with other current, past and reasonably foreseeable actions could work cumulatively with the management activities/natural events discussed above to limit the potential to achieve healthy population densities in certain populations.

Alternatives 2 and 3 would promote improvement in stream conditions through long-term reductions in sediment delivery and physical impacts to stream channels, which would promote positive shifts in stream function across the analysis area. Therefore, the effects of the Stonewall Vegetation Project proposed actions when considered cumulatively with other past, present and reasonably foreseeable actions should promote the attainment of better habitat conditions, and more abundant and resilient aquatic populations.

The analysis used a practical approach outlined in Ruggiero et al. (1994) and Region 1 guidance (Draft 01/30/2004) in conjunction with criteria established by Rieman et al. (1993). Selected habitat attributes considered both ecologically significant to fish and sensitive to land management disturbances are borrowed from Overton et al. (1995) and Region 1 guidance (Draft 1/30/2004). The population consists of both fluvial and resident components Pierce et al. (1997). Radio tracking of WCT indicates wide-ranging movements and use of various tributaries for spawning (Pierce et al. 2004). This analysis predicts a short-term change in substrate composition risks, some minor downward trend in incubation and fry emergence success (birth rate) to the population before recovering to an improved trend over baseline after 3 years. Western cutthroat trout recruitment is likely more than adequate to offset minor short-term sediment increases near the populations in Beaver Creek and Keep Cool Creek.

In the long term, treating hydrologically connected roads helps recover gravel quality slightly over baseline conditions. Therefore, there is some minimal risk to viability for this western cutthroat trout population in the short term with a long-term trend of maintaining reproductive habitat within the acceptable range of variation.

The Biological Effects Determination for westslope cutthroat trout and western pearlshell mussel, if implementing alternative 2 or 3 is: **May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species**.

The Biological Analysis Determinations for bull trout and bull trout critical habitat is: **May effect, not likely to adversely affect.**

Recreation

Alternative 1, no action would have no direct or cumulative effects to recreation resources. The purpose and need for the Stonewall Vegetation Project "…improving the mix of vegetation and structure across the landscape so that it is diverse, resilient, and sustainable to wildfire and insects; modifying fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape; enhancing and restoring aspen, western larch and ponderosa pine species and habitats; utilizing the economic value of trees through removal; and integrating restoration with socioeconomic considerations" would not be addressed. Potential long-term indirect effects to recreation resources would be due to the ongoing risk of severe wildfire that could lead to changes in the recreation settings, visual qualities and naturalness within the roadless expanse.

Alternatives 2 and 3 propose activities that would have short-term direct effects to recreation resources during project implementation such as limited access to specific areas and increased presence of people and noise within the project area. Project design features are in place to limit potential affects. The proposed treatments would address the purpose and need for the Stonewall Vegetation Project, resulting in a more diverse, resilient and sustainable Forest ecosystem with reduction in risk of negative impacts from severe wildfire. Alternative 2 treats more acres and would have more effects than alternative 3. The long-term indirect effects to recreation would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area.

Cumulative effects to recreation resources would generally be short term, occurring during project implementation, and would relate to an increased presence of people, vehicles and the associated noise that may affect the recreation experience. Longer-term cumulative effects would impact the Pine Grove dispersed camping area, such as hazard tree removal and fence construction for a riparian exclosure, in addition to the actions proposed in the Stonewall Vegetation Project. These effects would remain until vegetation growth obscures the visible stumps from the vegetation treatment activities, approximately 3-5 years, but would remain consistent with Roaded Natural ROS class (p.5).

There would be no effects to the Lincoln Gulch IRA and fewer acres treated within the Bear-Marshall-Scapegoat-Swan IRA.

Inventoried Roadless Areas

Alternative 1, no action would have no direct or cumulative effects to roadless resources. Potential long-term indirect effects to roadless resources would be due to the ongoing risk of severe wildfire that could lead to changes in the recreation settings, visual qualities and naturalness within the roadless expanse.

Alternatives 2 and 3 would have short-term direct impacts to roadless resources during project implementation such as increased presence of people and noise within the project area. Project design features are in place to limit potential effects. The proposed treatments would result in a more diverse, resilient and sustainable forest ecosystem with a reduction in risk of negative impacts from severe wildfire. The long-term indirect effects from the action alternatives to roadless resources would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area. Alternative 2 would treat more acres than alternative 3.

Cumulatively there may be short-term impacts to solitude and undeveloped character with long-term benefits to naturalness throughout the IRA. Additional management activities within the IRA including travel planning, weed treatments and livestock grazing would also occur. These activities are compatible with the management of roadless resources and may cumulatively represent short-term impacts to solitude throughout the IRA due to the presence of people.

Visual

The characteristic landscape is expected to continue to perpetuate. Management activity viewed disturbances would increase when considering all viewed units proposed for treatment. However, with the project design features the VQOs would be met. Units where dead trees would be removed would ultimately look similar to the end result of the natural decay cycle. This alternative would decrease the length of time the dead trees are viewed in the landscape. Cumulative effects for this alternative are expected to be similar to alternative 2, with fewer acres impacted by alternative 3. Both action alternatives would allow the VQOs to be met and would be in compliance with the Forest Plan and other regulations with the implementation of the visual design features.

Cultural

The no-action alternative would have an undesired effect on cultural resources. Most significant of these is the increased risk of damage to cultural resources from catastrophic wildfires resulting in artifact damage, wooden structure and feature loss, and loss of site integrity through erosion.

Alternatives 2 and 3 could have both negative and positive impacts on cultural resources within the project area. There would be no adverse or negative effects with implantation of project design features and mitigation measures. The negative effects are the possibility of cultural resources damage from ground disturbance from the use of heavy machinery, log and tree removal, road construction, and the heat damage to resources from prescribed fires. The loss of vegetation can indirectly lead to vandalism to cultural resources because of the increased visibility. Project design features would mitigate adverse effects to cultural resources within the project area. Positive effects include the reduction of fuels that could result in fire damaged cultural resources and increased erosion of archaeological sites.

Alternatives 2 or 3 would meet the Helena National Forest management goals for cultural resources by reducing the risk of fire. Damages to cultural resources from wildfires, suppression efforts and erosion, are irreversible losses of cultural resources. With project design features the project is anticipated to have no adverse effect.

If additional cultural resources are discovered during implementation of this project, work should cease in the area and a Forest Archaeologist would be contacted. Work in the area could only resume if mitigation measures can be determined and/or re-evaluated if necessary.

Economic Financial Efficiency

Project feasibility and financial efficiency indicates that both action alternatives are financially inefficient (negative Present Net Value (PNV)) when including all activities associated with the analysis. Both action alternatives are feasible when considering only timber harvest and the required design criteria. Alternative 2 has the highest PNV for the timber harvest and required design criteria at positive $178 thousand, and negative $1.2 million when considering all proposed activities. For alternative 3, the PNV for the timber harvest and required design criteria is positive $68 thousand, and negative $1.1 million for all proposed activities. The no-action alternative has no costs or revenues associated with it.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no-action alternative would not harvest timber or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management (e.g., reduced fuel loadings for future reduced fire severity, improving vegetative species mix across the landscape) are nonmarket benefits.

Economic Impact

The no-action alternative would not change jobs or income because there are no proposed project activities associated with this alternative.

Alternative 2 proposes harvest of 22,022 hundred cubic feet (Ccf) of timber products and could result in a total of 171 jobs and labor income at $7.7 million over the life of the project. On an annual basis, this would amount to approximately 38 jobs per year over a period of 10 years. Annual effects are greatest with this alternative since it has the most timber harvest. If the harvest takes longer than anticipated, the total impacts would remain the same, but the annual contributions would be reduced. Approximately 134 direct, indirect and induced jobs and $6.6 million of labor income are associated with the proposed timber harvest activities, with the rest associated with restoration activities.

Alternative 3 proposes harvest of 14,299 Ccf of timber products could result in a total of 118 jobs and $5.2 million in total labor income over the life of the project. On an annual basis, this would amount to approximately 25 jobs per year over a period of 10 years, and $1.2 million annually in total labor income. Approximately 87 direct, indirect and induced jobs and $4.3 million of labor income would be associated with the timber harvest activities, with the rest associated with restoration activities.

Environmental Justice

More employment and labor income opportunities would be created by alternatives 2 and 3 when compared to no action. Implementation of any of the action alternatives would not likely adversely affect minority or low-income populations. Implementation of the no-action alternative maintains the status quo and provides no additional employment or income in the economic impact area.

The Executive Order also directs agencies to consider patterns of subsistence hunting and fishing when an action proposed by an agency has the potential to affect fish or wildlife. There are no Native American Reservations or designated Native American hunting grounds located in or near the analysis area. None of the alternatives restrict or alter opportunities for subsistence hunting and fishing by Native American tribes. Tribes holding treaty rights for hunting and fishing on the Helena National Forest are included on the project mailing list and have the opportunity to provide comments on this project.

Summary of Changes from the Draft Environmental Impact Statement

Changes to the draft environmental impact statement (EIS) that led to the development of this document were based on new information and comments from the public and other agencies on the draft EIS (see appendix A). The more substantive changes include the following:

- Updates to wildlife habitat information based on new information and database updates, including grizzly bear, Canada lynx, big game habitat and road information effects
- Mapping corrections and corresponding acre corrections
- Clarification of project design features
- Incorporation of new information and consideration of additional literature
- Addition of the response to comments submitted for the DEIS, updating appendix A
- Soils analysis detrimental soil disturbance calculations were revised based on information gathered following national and regional soil monitoring protocols

Acronyms

ADS	Aerial Detection Surveys
BD	Bulk Density
BMPs	Best Management Practices
BpS	Biophysical Settings
CE	Cumulative Effects
CWD	Coarse Woody Debris
d.b.h.	Diameter Breast Height
DEIS	Draft Environmental Impact Statement
DFB	Douglas-fir Beetle
DSD	Detrimental Soil Disturbance
DWD	Down Woody Debris
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FIA	Forest Inventory Analysis
FP	Forest Plan
FRCC	Fire Regime Condition Class
FS	Forest Service
GHG	Greenhouse Gasses
HNF	Helena National Forest
INFISH	Inland Native Fish Strategy
IRA	Inventoried Roadless Area
LAU	Lynx Analysis Unit
LRMP	Land and Resource Management Plan
MAAQS	Montana Ambient Air Quality Standards
MDEQ	Montana Department of Environmental Quality
MFRC	Montana Forest Restoration Committee
MFWP	Montana Fish, Wildlife and Parks
MPB	Mountain Pine Beetle
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NNIS	Nonnative Invasive Species
NRLMD	Northern Rocky Mountain Lynx Management Direction
PFA	Post Fledgling Area
SWCC	Southwestern Crown Collaborative
TMDL	Total Maximum Daily Load
TPA	Trees per Acre
USDA	United States Department of Agriculture

USDI	United States Department of the Interior
USFWS	United States Department of Fish and Wildlife Service
WSB	Western Spruce Budworm
WUI	Wildland Urban Interface

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Preface

Document Structure

The Forest Service has prepared this environmental impact statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1.* Purpose of and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2.* Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's proposed action as well as the no-action alternative and other alternative methods for achieving the stated purpose. These alternatives were developed based on cause/effect relationships raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3.* Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by components of the ecological, social, and political environment.
- *Chapter 4.* Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Appendices:* The appendices are in a separate document and provide more detailed information to support the analyses presented in the environmental impact statement.
- *Index:* The index provides page numbers by document topic.

Additional documentation, including detailed analyses of resources in the project area, are in the project planning record located at the Lincoln Ranger District Office, Lincoln, Montana.

Summary of Changes from the Draft Environmental Impact Statement

Changes to the draft environmental impact statement that led to the development of this document were based on new information, and comments from the public and other agencies on the draft EIS (appendix A). The more substantive changes include the following:

- Updates to wildlife habitat information based on new information and database updates, including big game hiding cover and road information effects.
- Mapping corrections and corresponding acre corrections.
- Clarification of project design features
- Incorporation of new information and consideration of additional literature.
- Addition of the response to comments submitted for the DEIS, updating appendix A.

- Soils analysis detrimental soil disturbance calculations were revised based on information gathered following national and regional soil monitoring protocols.
- Field inventories were conducted in 2014 to gather more cultural resource data within the Stonewall Project area.

Chapter 1. Purpose of and Need for Action

Introduction

The Forest Service has prepared this environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

Within the Stonewall Vegetation Project area, fire suppression and growing conditions over the last century resulted in a loss of open forest conditions and seral species (aspen, ponderosa pine and western larch). This created a more uniform landscape comprised of dense forests (Douglas-fir and lodgepole pine) susceptible to insect and wildfire mortality. In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and ponderosa pine. These conditions are elevating fuel levels that pose a wildfire threat to nearby homes and communities in the wildland urban interface (WUI).

In 2006, the Forest Service initiated the planning process for the Stonewall Vegetation project, (at that time referred to as the Stone-Dry area) with reviews of database information and ground conditions within the watershed.

Due to an interest in management of the Lincoln Ranger District, the Lincoln Restoration Committee (LRC), a group of private citizens with diverse community interests, was formed in 2008 (formerly the Lincoln Working Group) as part of the Montana Forest Restoration Committee (MFRC). The MFRC is a collaborative group with representatives from diverse interests who came together in 2007 to address forest stewardship issues. This group adopted 13 restoration principles for on-the-ground treatments.

The LRC came together with the purpose of developing recommendations for restoration projects on the Lincoln Ranger District, while working within the framework developed by the MFRC. Typically with projects, the Forest Service develops a proposed action for an area and then distributes it to the public for comment. On the Stonewall Project, the Helena National Forest has been working with the LRC in compliance with Executive Order 13352 of August 2004—Facilitation of Cooperative Conservation. The LRC developed recommendations for the Stonewall area considering several of the 13 restoration principles. These principles are consistent with the goals and standards of the Helena Forest Plan and current Forest Service policy and direction (table 1).

Overall, the Stonewall Vegetation Project focuses on restoration of tree species diversity for improvement of wildlife habitat and reducing fuels allowing for the reintroduction of fire.

Table 1. Crosswalk of MFRC Principles with Forest Service direction

MFRC Principles	Forest Plan (FP)/Forest Service Manual (FSM) /Forest Service Handbook (FSH)/ Code of Federal Regulations (CFR) direction
1. Restore functioning ecosystems	FSM 2020 Ecological restoration and resilience
2. Apply adaptive management	FSH 1909.15 14.1 Adaptive management strategy 36 CFR 220.3 – Definitions (Adaptive Management) and 36 CFR 220.5(2)
3. Use appropriate scale of analysis to prioritize and design activities	FSH1909.15 11 scoping; 40 CFR 1501.7 36 CFR 220.4(e) Scoping. Possibly 36 CFR 220.4(a)
4. Monitor restoration outcomes	FP (pp. III/96-987) management area monitoring; FP (pp. IV/3-20); R/7 monitoring and evaluation)
5. Reestablish fire as a natural process	FP (Goal p. II/2). 14. Provide a fire protection and use program which is responsive to land and resource management goals and objectives. FP (standards and guidelines pp. II/33-34; R/1-8). Prescribed fire provides the opportunity to manipulate vegetation for the benefit of timber, wildlife, and range management and reduces the potential for damaging wildfire. Appendix R
6. Consider social constraints and seek public support for reintroduction of fire	FP (standards and guidelines pp. II/33-34; R/1-8). Prescribed fire provides the opportunity to manipulate vegetation for the benefit of timber, wildlife, and range management and reduces the potential for damaging wildfire. Appendix R; FSH1909.15 11 scoping
7. Engage the community and interested parties	FSH1909.15 11 scoping; 40 CFR 1501.7 36 CFR 220.4(e)-Scoping, 36 CFR 215.5 & 215.6
8. Improve habitat and connectivity	FP (Goals p. II/1). 4. Maintain and improve the habitat over time to support big game and other wildlife species.
9. Emphasize ecosystem goods and services, and sustainable land management	FP (Goals pp. II/1-I/2). .
10. Integrate restoration with socioeconomics	FSM 1970 Economic and social evaluation; FSH 1909.17 economic and social analysis
11. Enhance education and recreation activities to build support for restoration	FP (Forest-wide standard p. II/14). 4. Whenever possible, use public education and information programs as well as public involvement to help gain support and understanding of our management objectives and activities.
12. Protect and improve overall watershed health	FP Goal #10, and riparian standards and guidelines (pp. II/34-35)
13. Establish and maintain a safe road and trail system that is ecologically sustainable	FP (standards and guidelines pp. II/31-33) Road management, maintenance, and trails

Project Area

The Stonewall Vegetation Project area (project area) covers approximately 24,010 acres (approximately 23,670 acres are National Forest System lands) within Lewis and Clark and Powell Counties, Montana. The project area is on the Lincoln Ranger District, approximately 4 miles north and west of the town of Lincoln, Montana. The legal description for the project area is all or portions of Township (T) 14 North (N), Range (R) 9 West (W), sections 5-8, 17, 18, 20, 29; T14N, R10W, sections 1, 2, 11-13; T15N, R8W, sections 19, 20, 29, 30-32; T15N, R9W, sections 7, 8, 10, 11, 14-36; T15N, R10W, sections 25, 35 and 36; Principle Meridian, Lewis and Clark and Powell Counties, Montana (figure 1).[1]

[1] Note: All acreage and mileage figures in this document are approximate.

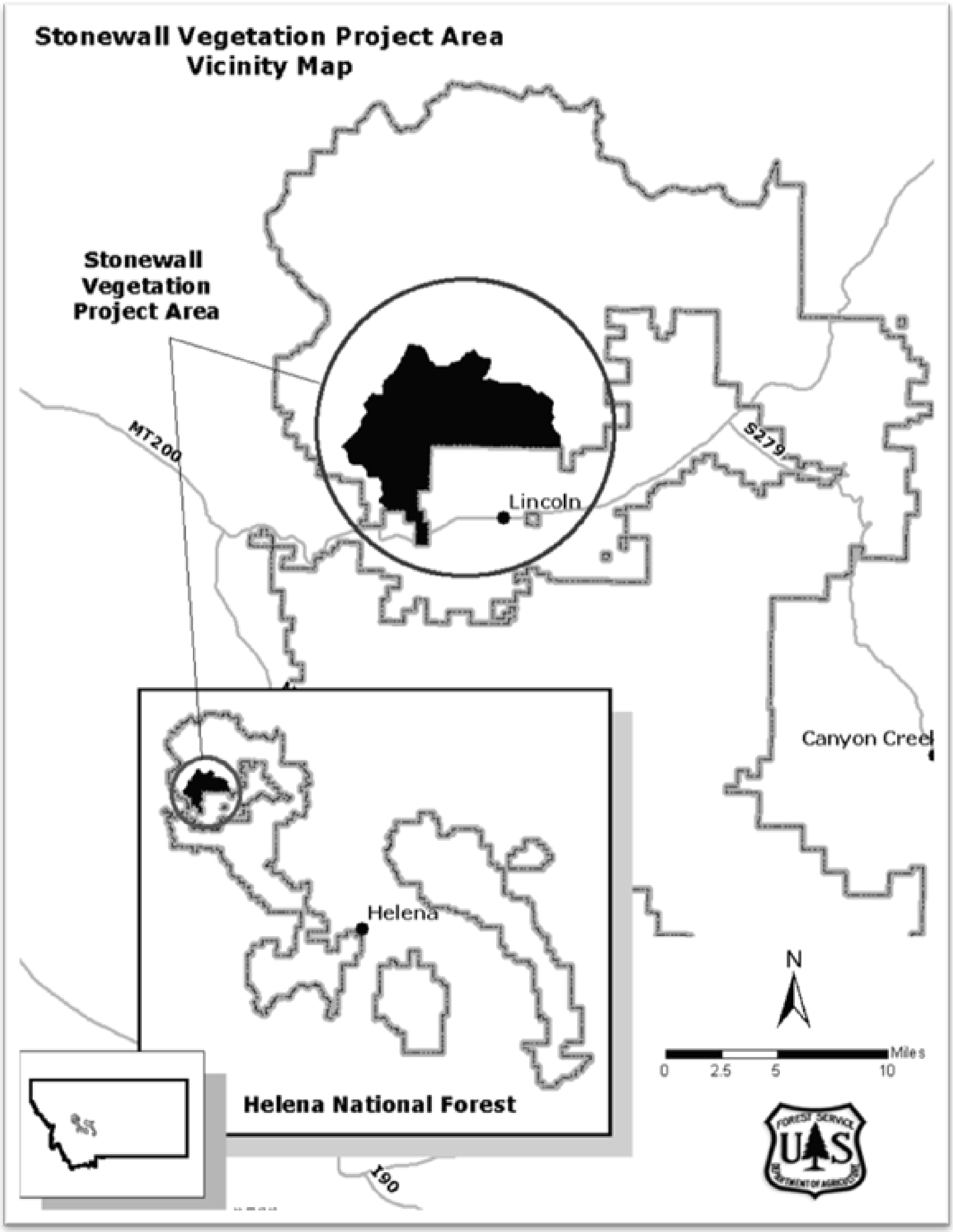

Figure 1. Stonewall Vegetation Project Area Vicinity Map

Regulatory Framework

National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning. The laws, regulations and policies relevant to this proposed project analysis are discussed in the individual specialist reports and include, but are not limited to:

The National Environmental Policy Act (NEPA 1969). The Forest Service has prepared this environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

The National Forest Management Act (NFMA) of 1976 governs vegetation management on national forest lands. Several sections in the act, and its accompanying regulations (USDA Forest Service, 1982), specifically address terms and conditions relevant to the vegetation resource. These include sections on timber suitability and management requirements for vegetative manipulation, including tree regeneration timeframes and opening size limits. Proposed regeneration harvest units exceed 40 acres in seven units. All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size (See also Appendix B, pages 224 and 230).

The Endangered Species Act of 1973, as amended (ESA 1973, 16 U.S.C. 1531) provides direction to the Forest Service to establish objectives for habitat management and recovery through the Forest Plan for the conservation and protection of endangered and threatened species. This project is consistent with the Forest Plan for listed species and is therefore consistent with these guidelines. The U.S. Fish and Wildlife Service was consulted to determine which species required evaluating for the project. An analysis of effects on listed species was conducted and documented in a Biological Evaluation. Consultation is ongoing and will be completed prior to issuing a decision on this project.

The Migratory Bird Treaty Act, Presidential Executive Order 13186 10 January 2001. Migratory birds are included under the Migratory Bird Treaty Act (MBTA) and incorporate most species of birds present in the project area. In December 2008, the Forest Service entered into a memorandum of understanding (MOU) with the United States Department of Interior (USDI) Fish and Wildlife Service on the Migratory Bird Treaty Act to further clarify agency responsibilities (USDA Forest Service and USDI Fish and Wildlife Service 2008). Four key principles embodied in the MOU direct the Forest Service to (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Executive Order 13186 directs departments and agencies to take certain actions to further implement the MBTA. Specifically, the Order directs Federal agencies, whose direct activities will likely result in the "take" of migratory birds, to develop and implement a memorandum of understanding with the USFWS that shall promote the conservation of bird populations. Under Executive Order 13186 the USFWS is responsible to ensure that environmental analyses of Federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

In 1963 Congress passed the **Federal Clean Air Act** and amended the act in 1970, 1977, and 1990. The purpose of the act is to protect and enhance air quality while ensuring the protection of public health and welfare. The 1970 amendments established National Ambient Air Quality Standards (NAAQS), which must be met by most state and federal agencies, including the Forest Service.

States are given the primary responsibility for air quality management. Section 110 of the Clean Air Act requires states to develop State Implementation Plans (SIPs) that identify how the state will attain and maintain NAAQS. **The Montana Clean Air Act** (MCAA)(1967) promulgates the SIP and created the Montana Air Quality Bureau (now under the Montana Department of Environmental Quality-MDEQ). The Clean Air Act also allows states, and some counties, to adopt unique permitting procedures and to apply more stringent standards.

The Environmental Protection Agency's 1980 visibility rules (40 CFR 51.301-307) protect mandatory class 1 areas from human-caused impairments reasonably attributable to a single or small group of sources. In 1999, EPA adopted the **Regional Haze Rule** (40 CFR 51.308-309), mandating each state to develop a Regional Haze State Implementation Plan (SIP) to incorporate measures necessary to make reasonable progress towards national visibility goals. It calls for states to establish goals for improving visibility in mandatory class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment. The Regional Haze Rule also requires states to address visibility impairment in mandatory class 1 areas due to emissions from fire activities. The preamble to the rule emphasizes the "implementation of smoke management programs to minimize effects of all fire activities on visibility." The rule requires states to address visibility effects from all fire sources contributing to visibility impairment in mandatory class 1 areas (Story 2005). Visibility impairment is a basic indicator of air pollution concentrations and is recognized as a major air quality concern in the Clean Air Act Amendments of 1977. Visibility variation occurs as a result of the scattering and absorption of light by particles and gases in the atmosphere.

The Interim Air Quality Policy on Wildland and Prescribed Fires (U.S. EPA 1998) suggests that air quality and visibility impact evaluations of fire activities on Federal lands should consider several different items during planning (EPA 1998). In a project-level NEPA document, it is appropriate to consider and address to the extent practical, a description of applicable regulations, plans, or policies, identification of sensitive areas and the potential for smoke intrusions in those sensitive areas. Other important disclosure items include applicable smoke management techniques, participation in a basic smoke management program, and potential for emission reductions. Typically ambient air quality, visibility monitoring, and cumulative impacts of fires on regional and sub-regional air quality are not explained to the same level of detail. Ambient air quality and visibility monitoring (for class 1 areas) are typically done collaboratively with the states. Impacts to regional and sub-regional air are addressed operationally through a coordinated smoke management program. The EPA urges states to develop, implement, and certify smoke management programs that meet the recommended requirements of the Interim Policy. This project meets the intent of the Interim Policy through the NEPA analysis process.

The General Conformity Rule implements the Clean Air Act conformity provision, which mandates that the Federal government not engage, support, or provide financial assistance for licensing or permitting, or approve any activity not conforming to an approved Clean Air Act implementation plan. In 2010, EPA promulgated revised General Conformity Rules (75 FR 17254). In the revised rules, prescribed fire activities are considered to “presume to conform” in states that have an EPA-certified state smoke management program. Since Montana’s smoke management program is EPA-certified, prescribed fire activities are presumed to meet Clean Air Act General Conformity Rule requirements.

The Western Regional Air Partnership (WRAP) (1997) is a voluntary partnership of states, tribes, local air agencies, federal land managers and EPA. The Partnership recognizes the unique legal status and jurisdiction of tribes and seeks to promote policies that ensure fair and equitable treatment of all participating members of the WRAP. The Partnership also recognizes state, tribal and local air agency authority and responsibility to develop, adopt, and implement individual air quality plans within their jurisdictions. The WRAP revised their charter in 2009. The new purposes of the WRAP are as follows:

The MDEQ issues an annual burn permit to all entities defined as major open burners, including the Forest Service. As required in the burning permit, burners implement Best Available Control Technologies (BACT) on each prescribed fire. BACT means “those techniques and methods of controlling emission of pollutants from an existing or proposed open burning source to limit emissions to the maximum degree that MDEQ determines, on a case-by-case basis, is achievable for that source, MDEQ takes into account impacts on energy use, the environment, and the economy, and any other costs, including the cost to the source” (**Montana/Idaho Airshed Group Operating Guide 2010)**

The Federal Clean Water Act, as amended, is commonly referred to as the Clean Water Act (CWA). This required each state to develop its own water quality standards, subject to the approval of the Environmental Protection Agency (EPA). Section 303(d) of the CWA required each state to assess all water bodies within its borders in order to identify water quality impairments that exceeded state standards. Under the CWA, water bodies identified as impaired generally require the development of a “Total Maximum Daily Load” (TMDL—a water quality restoration plan). The state is required to systematically develop these plans in collaboration with the EPA. A water body’s status on Montana’s 303(d) list dictates, to a certain extent, the water quality standards under state law. Points of sediment delivery to “waters of the U.S.” from haul roads may require National Pollutant Discharge Elimination System (NPDES) discharge permits prior to hauling. A TMDL and water quality restoration plan for the Blackfoot River was completed in 2004.

Executive Order 11988 requires that agencies avoid adverse impacts associated with occupancy and modification of floodplains. It generally applies to the 100-year floodplain.

Executive Order 11990 states that agencies shall minimize destruction, loss, or degradation of wetlands and shall preserve and enhance their natural and beneficial values. Agencies are to avoid construction in wetlands unless it is determined that there is no practicable alternative and that all practicable measures are taken to minimize harm to wetlands.

Montana Code Annotated (MCA) 75-5-303: Non-Degradation Policy mandates that “existing uses of state waters and the level of water quality necessary to protect those uses must be maintained and protected,” although activities existing as of April 1993 that generate non-point-source pollution are exempted from this policy (MCA 75-5-303[1-2], MCA 75-5-317[2][a]). This exemption would apply to most Helena National Forest System roads.

Montana Code Annotated (MCA) 75-5-703: Development and Implementation of TMDLs: In water bodies for which a TMDL has been developed and implemented, Montana law supports a “voluntary program of reasonable land, soil, and water conservation practices for nonpoint source activities for water bodies” in order to achieve compliance with water quality standards (MCA 75-5-703 [8]). In water bodies identified as impaired and in need of TMDL development, but for which no TMDL has been completed, “new or expanded nonpoint source activities affecting a listed water body may commence and continue if those activities are conducted in accordance with reasonable land, soil, and water conservation practices” (MCA 75-5-703 [10][c]). Roads proposed for treatment in this project fall under both categories.

Montana Code Annotated (MCA) 77-5-301: Streamside Management Zone (SMZ) Act governs what harvest-related activities may occur in riparian and wetland areas adjacent to streams.

Administrative Rules of Montana (ARM) 17.30.6: In the Administrative Rules of the Montana Water Quality Act (17.30.622(f) –17.30.624(f)), no increases are allowed above naturally occurring concentrations of sediment or suspended sediment, settable solids, oils or floating solids detrimental or injurious to public health, recreation, safety, welfare, livestock, wildlife, birds and fish. The goal is to protect designated beneficial uses and meet or exceed Montana surface water quality standards. See the Hydrology Report (McNamara 2015) for more information on the administration of applicable state direction.

Fish and Wildlife Conservation Act of 1980: It is the purpose of this act to provide (1) financial and technical assistance to the states for development and implementation of conservation plans and programs for nongame fish and wildlife; and (2) to encourage all Federal agencies and departments to utilize their statutory and administrative authority, to the maximum extent practicable, to conserve and promote conservation of nongame fish and wildlife and their habitats.

Montana’s Comprehensive Fish and Wildlife Conservation Strategy is a collaborative effort among agencies, organizations, and individuals within the State to address wildlife and fish species of greatest conservation need. The purpose of the strategy is to assess the diversity of fish and wildlife and their habitats, identify threats or concerns facing native species, and develop conservation actions that can be implemented to restore the diversity of Montana’s native species (Montana Fish, Wildlife and Parks 2005).

The Plant Protection Act (2000) defines a noxious weed as, "any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment" (7 U.S.C. 104 § 7702, 2000).

T**he Federal Noxious Weed Act** (1974) provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health. The Act requires that each federal agency: develop a management program to control undesirable plants on federal lands under the agency's jurisdiction; establish and adequately fund the program; implement cooperative agreements with state agencies to coordinate management of undesirable plants on federal lands; establish integrated management systems to control undesirable plants targeted under cooperative agreements. A federal agency is not required to carry out management programs on federal lands unless similar programs are being implemented on state or private lands in the same area.

The Montana Weed Control Act (1948) was established to protect Montana from destructive noxious weeds. This act, amended in 1991, has established a set of criteria for the control and management of noxious weeds in Montana. Noxious weeds are defined by this act as being any exotic plant species which may render land unfit for agriculture, forestry, livestock, wildlife or other beneficial uses, or that may harm native plant communities.

National Historic Preservation Act, **Section 106 (1966 as amended)** provides direction for Federal agencies to establish a program for preservation of historic properties. In compliance with this ac, a review was conducted to determine if cultural resources surveys had been conducted with in the project area, and if cultural resources sites had been record. Potential impacts to sites eligible for the National Register of Historic Places (NRHP), as well as for those not yet evaluated, were considered in this analysis. In accord with 36 CFR 800, Protection of Historic Properties, it is the policy of the Forest Service to protect those sites determined NRHP eligible, as well as those sites not yet formally evaluated. The result of the Heritage Resource analysis conducted is in the specialist report in the project record (Nolan 2012). Project design features developed to protect heritage resources are listed in chapter 2. Consultation with the State Historic Preservation Office for concurrence will be completed prior to issuing a decision on this project.

The Native American Graves Protection and Repatriation Act, and the **American Indian Religious Freedom Act** of 1978 require Federal agencies to consult with culturally affiliated tribes and determine possible effects to sties another culturally significant resources resulting from activities within a proposed project area.

Forest Service Manual (FSM) and Forest Service Handbook (FSH): The Forest Service Manuals and Handbooks provide management direction and guidance for Forest Service analysis and activities. See the individual specialist reports for the applicable sections.

Helena National Forest, Forest Plan of 1986, as amended; Forest Plan Management Direction

The Forest Plan provides guidance for managing National Forest System lands. Guidance from the Record of Decision for Amendments to the Forest Plan (1986) is incorporated in the Forest Plan. The actions proposed in this project are designed to be consistent with the Forest Plan, including all plan amendments currently in effect, to the extent possible given the existing conditions. Where Forest Plan direction may not be met, a site-specific Forest Plan amendment would be proposed.

Forest management must also consider direction in the Inland Native Fish Strategy (INFISH 1995) which provides direction to protect habitat and populations of resident native fish outside of anadromous fish habitat. Other pertinent direction including the Northern Rockies Lynx Management Direction (NRLMD 2007) is also considered.

The Forest Plan provides two types of management direction, Forestwide direction and management area (MA) direction. Forestwide direction, which applies to all MAs, is located on pages II/14 through II/36 of the Forest Plan.[2]

Table 2 lists the acres of each MA found within the project boundary, and relevant goals by MAs as described in the Forest Plan. The project area overlaps with two inventoried roadless areas (IRAs) (figure 2).

Table 2. Management Areas

MANAGEMENT AREA (ACRES)	PAGES IN FOREST PLAN	GOALS RELEVANT TO THIS PROPOSAL
M1 (8,097 acres)	M-1 III/5-III/7	Maintain the present condition with minimal investment for resource activities, while protecting the basic soil, water, and wildlife resources.
T1 (2,682 acres)	T-1 III/30-III/33	Provide healthy timber stands and optimize timber growing potential over the planning horizon. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for dispersed recreation opportunities, wildlife habitat, and livestock use, when consistent with the timber management goals.
T2 (1,655 acres)	T-2 III/34-III/37	Provide for the maintenance and enhancement of big game winter range. Harvest timber on a programmed basis, consistent with big game winter range values. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for other uses as long as these uses are compatible with timber and big game winter range management goals.
T3 (5,649 acres)	T-3 III/38-III/41	Maintain and/or enhance habitat characteristics favored by elk and other big game species. Provide healthy timber stands and a timber harvest program compatible with wildlife habitat goals for this area. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability. Provide for other resource objectives where compatible with the big game summer range and timber goals
T4 (900 acres)	T-4 III/42-III/45	Maintain healthy stands of timber within the visual quality objective of retention and partial retention. Provide for other resource uses as long as they are compatible with visual quality objectives. Emphasize cost-effective timber production, while protecting the soil productivity. Maintain water quality and stream bank stability.
W1 (4,685 acres)	W1 III/50-III/52	Optimize wildlife habitat potential, including old growth, over the long term. Provide for other resource uses, if they are compatible with wildlife management goals.

[2] Note: All Forest Plan page references in this document refer to the versions of the Forest Plan and amendments as of March 2012; these can be found at: http://www.fs.fed.us/r1/helena/projects/plans/hnf-forestplan.pdf and http://www.fs.fed.us/r1/helena/projects/plans/hnf-forestplan-amend1-28.pdf.

Purpose and Need for Action

The purpose and need for action is determined by the extent and intensity of differences between the existing and desired conditions. Where there is little difference between these two conditions, the need for action is low. However, the need for action in this analysis area is compelling.

Due to vegetation conditions in the project area being relatively homogenous by type, the area has not been very resilient to insects and disease. Stands were and are susceptible to insect attack and the mountain pine beetle outbreak has spread through the project area and many other stands remain highly susceptible to Douglas-fir beetle. Different types of proposed treatments would create more diverse vegetative structure moving the area towards more heterogeneous than homogeneous conditions. By taking actions now, a more diverse and sustainable forest may result moving the area towards meeting the Forest Plan direction of having a healthy and productive forest ecosystem.

From 2006 through 2009, the Lincoln Ranger District conducted broad scale assessments of the Stone Dry/Stonewall project area to identify, develop, and prioritize management recommendations for the 6th code Hydrologic Unit Code (HUC) area (Cole 2009a, b; Cole 2010; Farley 2009; Heinert 2009a, b; Ihle 2010; Kurtz 2009; Lundberg and Alvino 2006; Marr 2009; Milburn et al. 2006; Milburn 2009; Olsen 2010a, b, c; Randall 2009; Shanley 2009, 2010; Sitch 2009; USDA Forest Service 2010; Walch 2010; Wyatt 2009). The assessments characterized trends in the human, terrestrial, and aquatic features as well as vegetative conditions and ecological processes. The Stonewall area was shown to have a high departure from desired resource conditions.

The purpose of this initiative is to

- Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects.
    - Enhance and restore aspen, western larch, and ponderosa pine species and habitats.
- Modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape.
- Integrate restoration with socioeconomic considerations.
    - Utilize economic value of trees with economic removal.

Action is needed to reduce insect mortality related fuels within the wildland urban interface and move the landscape towards desired conditions described in the Forest Plan. This action responds to the goals and objectives outlined in the Forest Plan for the Helena National Forest, and helps move the project area towards desired conditions described in that plan (USDA Forest Service 1986).

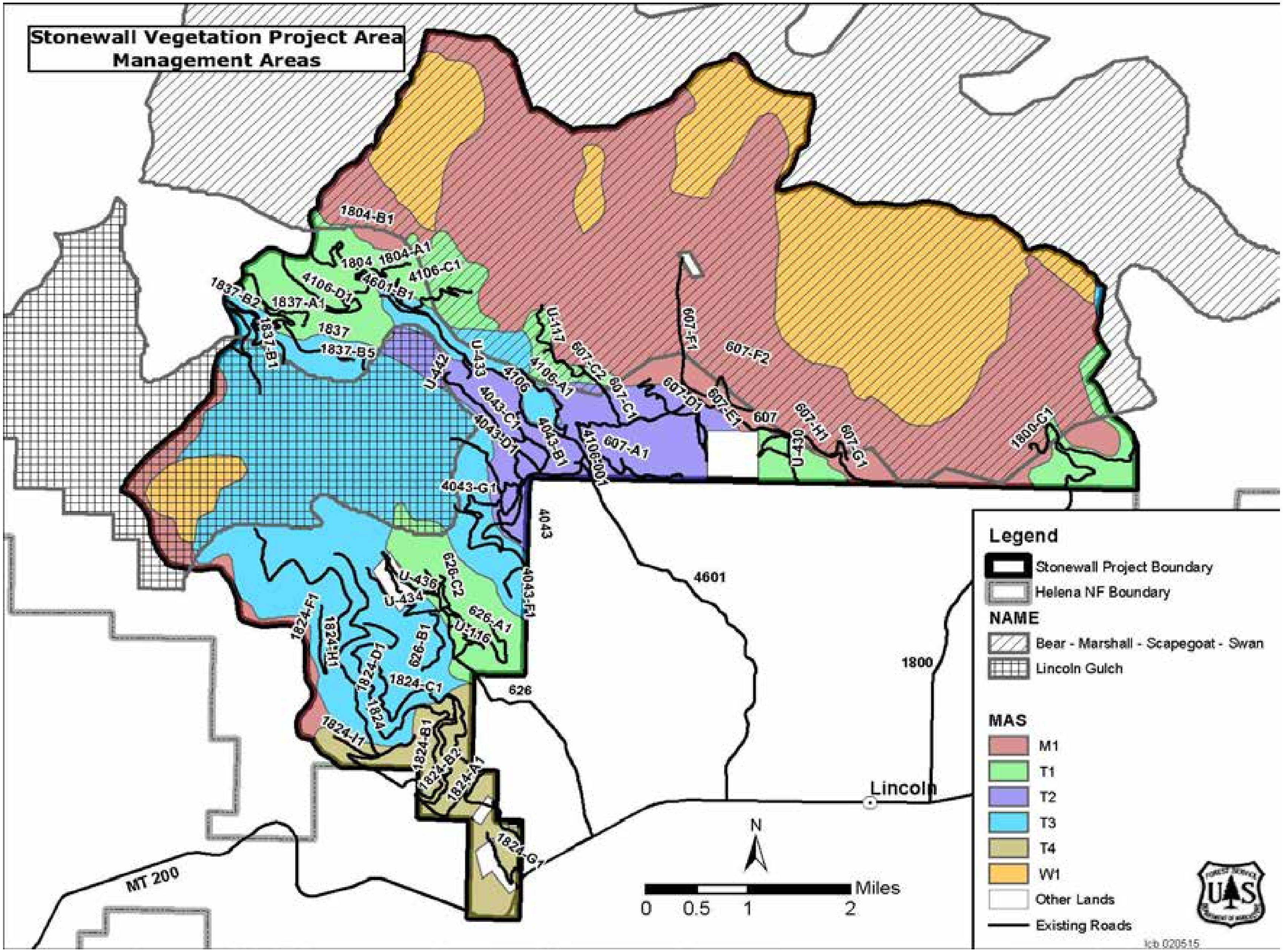

Figure 2. Stonewall Project management areas

Desired Condition

The Lincoln Ranger District completed a vegetation report as part of an ecosystem analysis at the watershed scale for the Stone-Dry area that includes the Stonewall project area (Milburn et al. 2006). In the analysis, they used the Fire Regime Condition Class (FRCC) system to describe reference vegetative, fuel and fire conditions and to compare them to current conditions (Milburn et al. 2009, FRCC 2005). The FRCC analysis for the area was updated in 2010 (Olsen 2010) including updates to the Biophysical Settings and vegetation-fuel classifications.

Biophysical Settings

Biophysical Settings (BpS) are land delineations based on the physical setting, (e.g. elevation and aspect) and the potential vegetation community that can occupy the setting. A national team has established in the FRCC system a set of descriptions for BpS found within regions of the United States (FRCC 2005). HNF ecologists, fuel specialists, and silviculturists reviewed the BpS descriptions applicable to the Stone Dry area and determined that the descriptions could be used for the Stone Dry area without modification (Milburn et al. 2009). For the Stone Dry analysis, HNF personnel spatially assigned BpS based upon habitat type (Milburn et al. 2009). Detailed descriptions for each BpS can be found in project records and a more detailed discussion of each BpS can be found in Milburn et al. (2009).

Figure 3 displays biophysical settings found in the Stonewall Project area with the proposed treatment unit locations. Table 3 displays the acres and percent of area represented by each biophysical setting within the project area.

Table 3. Biophysical setting acres and percent of project area

Biophysical Setting	Project Area Acres	Percent of Project Area
Barren	68	<1
Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	5,579	23
Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	5,862	24
Mountain Grassland with Shrubs	678	3
Mountain Shrubland	138	<1
Ponderosa Pine-Douglas-fir	7,742	32
Riparian	24	<1
Interior West Lower Subalpine Forest	3,331	14
Interior West Upper Subalpine Forest	580	2
Water	2	<1

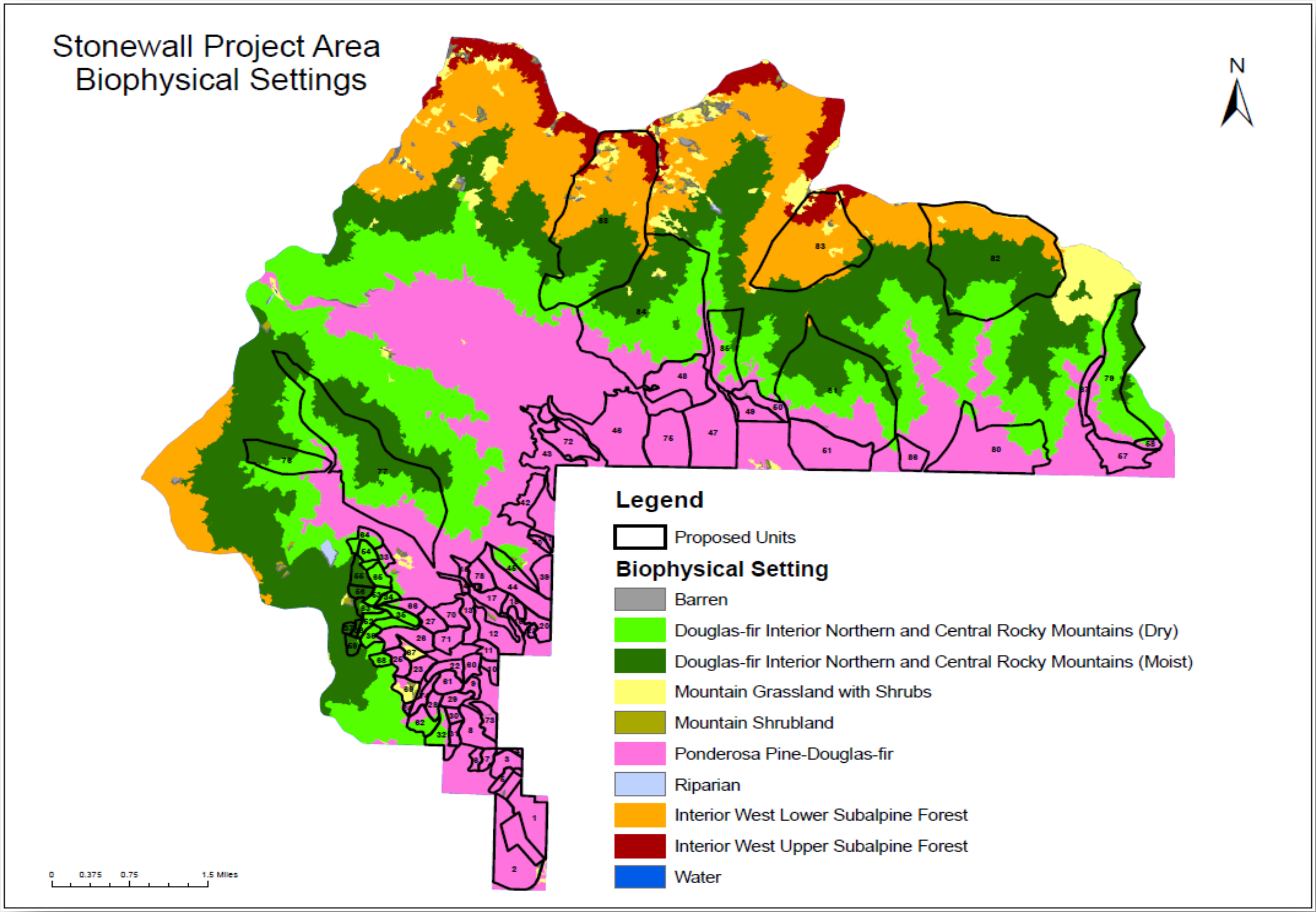

Figure 3. Biophysical settings within the Stonewall Project area

Several of the biophysical settings (e.g., water) constitute a very small portion of the project area or are not within proposed treatment units so we are not going to address them further in this analysis. This analysis addresses the following forested biophysical settings (Amell and Klug 2015):

Interior West Upper Subalpine Forest: Primarily dry, upper elevation whitebark pine (*Pinus albicaulis*) along with subalpine fir (*Abies lasiocarpa*). The majority of this stratum is found from 6,900 to 8,000 feet elevation (Milburn et al. 2009). The current fire frequency in this BpS is not different from the reference fire frequency (143-year mean fire return interval) but potential wildfire severity is higher than what would be expected under the reference conditions.

Figure 4. Ponderosa pine - Douglas-fir (unit 48) existing condition

Ponderosa Pine-Douglas-fir: Mostly ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*) and limber pine (*Pinus flexilis*), but other species can be present (Milburn et al. 2009). The majority of this stratum is within the 4,800- and 6,000-foot elevation range. The reference fire regime for this setting was one of high frequency (22-year mean fire return interval) and low intensity and severity (24 percent overstory mortality). Currently, the fire frequency is much higher (70 years) than the reference and expected severity is higher than reference (70 percent).

Douglas-fir Interior Northern and Central Rocky Mountains (Dry and Moist): Characterized as a transition from the warmer and drier forest types to cooler and moister forest types where lodgepole pine begins to dominate the stand composition (Milburn et al. 2009).

Figure 5. Douglas-fir interior dry (unit 35) existing condition

This BpS is subdivided into dry and moist strata (Milburn et al. 2009).

The dry Douglas-fir strata found at mid-elevations are stands dominated by Douglas-fir mixed with pine and other species.

The moist Douglas-fir stratum is primarily Douglas-fir and lodgepole pine mixed forests on mid- to high elevations. The reference fire regime was one of high frequency (30 year mean fire return interval) and low intensity and severity (10 percent overstory mortality). Currently, the fire frequency is much higher (70 years), and the expected severity is higher (70 percent) than the reference condition.

Interior West Lower Subalpine Forest: Primarily lodgepole pine (*Pinus contorta*) and subalpine fir/spruce (*Abies lasiocarpa/Picea Engelmannii*) forest on cool and moist climates. The reference fire regime was one of infrequent high-intensity and mixed-severity fires. The current frequency and severity is not substantially different from the reference condition. However, due to changes in species composition, stocking, and fuel loads that have taken place as the stands progressed from mid-seral to late-seral, greater overstory mortality than reference conditions (67 percent reference and 75 percent current) would most likely occur during wildfires.

Desired conditions for the BpS addressed in this analysis are as follows (Milburn et al. 2006, Milburn et al. 2009):

Interior West Upper Subalpine Forest: The desired condition is to have open stand conditions resembling the reference conditions in which open forests, both mid- and late-seral, constitute about 40 percent of the biophysical setting and early-seral about 20 percent. It is desired to have whitebark pine present in a variety of size/age classes, including openings with regenerating whitebark pine. Forests within the BpS would include a diverse mixture of tree species, with a complex structure (i.e., a mixture of size/age classes) and would be resilient to impacts from wildfires and insects.

Ponderosa Pine-Douglas-fir: The desired condition is to have open-storied, patchy stands dominated by ponderosa pine and Douglas-fir, with minor components of other species, that are resistant to crown fires, insects, and diseases. The stands would be nearly all-aged, multi-story with open understories and slightly sloping to flat diameter distributions and dominated by fire-resistant tree species. This would be consistent to what research indicates can be expected to occur given the species present and the desired and expected future fire regime.

Figure 6. Desired condition ponderosa pine - Douglas-fir after regeneration

Douglas-fir Interior Northern and Central Rocky Mountains: The desired condition is to have open-storied, patchy stands dominated by Douglas-fir–with components of other species–that are resistant to crown fires, insects, and disease. Species compositions would vary between the dry Douglas-fir, which would be mostly Douglas-fir and ponderosa pine with minor components of other species and the moist Douglas-fir in which other species such as lodgepole pine and western larch would have greater presence.

Figure 7. Desired condition Douglas-fir interior

Interior West Lower Subalpine Forest: The desired condition is to have a mixture of vegetation fuel classes resembling the reference conditions in which early seral, mid-seral closed overstory canopy, mid-seral open and late-seral closed overstory canopy are well and relatively evenly represented. Forests within the BpS would be a diverse mixture of tree species and age/size classes making them resilient to impacts from wildfires and insects.

Vegetation-Fuel Classes

The FRCC Guidebook lists 15 characteristic and uncharacteristic vegetation-fuel classes FRCC (2005). Five characteristic vegetation-fuel classes from the Fire Regime Condition Classification Workbook, V 1.2 were used (Milburn et al. 2006), and are described as follows:

- **AESP** is an early seral stage with various dominant lifeforms, depending on the Bps setting. This stage is the first vegetative response to a disturbance such as fire, insects, disease or logging which has removed or killed the overstory.
- **BMSC** is a mid-seral stage that is dominated by conifers that are in a forested setting, or dominated by perennial grasses or shrubs in a nonforest setting. This class represents a closed overstory canopy with trees that are 5 to 9 inches diameter at breast height (d.b.h.). “Closed” is defined differently for various settings. For example, Ppdf1 (dry ponderosa pine/Douglas-fir) is considered closed when canopies cover greater than 30 percent of the forested area, or stand. DFIR2 (dry Douglas-fir) is considered closed when canopies are greater than 50 percent closed.
- **CMSO** is a mid-seral stage similar to BMSC, but is an “open” canopy. Again, the canopy cover varies by biophysical setting.
- **DLSO** is a late seral, open canopy stand. In a forested setting this type is dominated by trees that are greater than 9 inches d.b.h. and is older than a mid-seral stand.
- **ELSC** is a late seral closed canopy stand.

The desired composition for the landscape is discussed in terms of vegetation-fuel classes for each BpS (Milburn et al. 2009). The desired composition is displayed in table 4 for each BpS.

Table 4. Desired vegetation-fuel classes for each Biophysical Setting

Biophysical Setting	AESP	BMSC	CMSO	DLSO	ELSC
Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	15	25	20	25	15
Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	15	25	20	25	15
Ponderosa Pine-Douglas-fir	15	10	25	40	10
Interior West Lower Subalpine Forest	20	40	10	5	25
Interior West Upper Subalpine Forest	20	25	25	15	15

AESP- Early-seral
BMSC- Mid-seral Closed
CMSO- Mid-Seral Open
DLSO- Late-seral Open
ELSC- Late-seral Closed

Habitat Types

The project area is heavily dominated by subalpine habitat types which cover about 69 percent of the area. Second in presence are Douglas-fir habitat types which cover about 18 percent of the area. Whitebark pine-subalpine fir and spruce habitat types each cover only about 0.3 percent of the area. The rest of the area is covered by rock, grass, meadows, water or private land.

With the habitat type coverage in the project area species such as ponderosa pine, lodgepole pine, quaking aspen, western larch, and whitebark pine are always or almost always a seral species, and as such which would decline in presence and eventually die out of the stands without disturbance (Pfister et al.1977, Fischer and Bradley 1987). Douglas-fir would be seral to subalpine fir on about 69 percent of the area.

Ponderosa Pine (*Pinus ponderosa*)

As displayed and discussed above: (1) about 32 percent of the project area is classified to be in the “ponderosa pine-Douglas-fir” BpS with the desired condition for the BpS to be open-storied, patchy stands dominated by ponderosa pine and Douglas-fir and (2) about 23 percent of the project area is in the dry “Douglas-fir Interior Northern and Central Rocky Mountains” BpS with a desired condition of mostly Douglas-fir and ponderosa pine with minor components of other species. The desired condition for ponderosa pine in the project area then can be stated as being the major dominant species with Douglas-fir as co-dominant on 32 percent of the project area and Douglas-fir as the major dominant species with ponderosa pine as the co-dominant on about 23 percent of the project area.

Quaking Aspen (*Populus tremuloides*)

The Forest Plan does not contain specific direction for management areas in the project area concerning quaking aspen. Quaking aspen exists in the project area as generally small clones seral to a climax-dominant conifer species. It is difficult to quantify how much is currently on the landscape because of their small size (figure 3), and it is also difficult to quantify the desired presence of aspen as a portion of the landscape. Aspen is considered an important component of the landscape because of its value as wildlife habitat and aesthetics, and in general the desired condition is to have aspen available as a minor but substantial component of the landscape at levels greater than currently exists. Several age classes of aspen should be present on the landscape from young to old and decadent.

Western Larch (*Larix occidentalis*)

The Forest Plan does not contain specific direction for the management areas in the project area concerning western larch management, but as displayed above, there is a Forest-wide standard indicating that western larch is the most preferred species as snag habitat. As with aspen, because of its value as wildlife habitat and aesthetics, we do consider western larch to be an important component of the landscape and in general can say that the desired condition is to have it available as a minor, but substantial, component of the landscape at levels greater than currently exists.

Whitebark pine (*Pinus albicaulis*)

The Forest Plan does not contain specific direction for the management areas in the project area concerning whitebark pine management, but it is widely recognized for its importance as wildlife habitat and that due to the impacts of insects (mountain pine beetle) and diseases (white pine blister rust) the species has been in a state of relatively rapid decline for several decades. The desired condition for whitebark pine is generally to be present in the upper elevations-in the subalpine fir biophysical settings-as a major seral species component and to have it present as a minor component in the moist Douglas-fir BpS. The desired condition is to have whitebark pine present in a variety of size/age classes, including openings with regenerating whitebark pine.

Existing Condition

The existing condition of the 24,000 acre project area has been shaped by management activities including: (1) many years of fire suppression, (2) 3,473 acres of harvest/regeneration treatments that created an early-seral stage following the treatment and of which a few are still providing most of the early seral in the project area (appendix R figure 13), and (3) 1,660 acres of other tree-cutting from 1950 to present. In natural fire events, 87 acres were burned in the Snow/Talon Fire (2003), and 261 acres were burned in the Keep Cool Fire (2006). In addition, natural processes such as succession and natural events such as droughts are always occurring (Amell and Klug 2015).

Biophysical Settings and Vegetation-fuel Classes

Biophysical settings as discussed above are based on physical setting and the potential vegetation community that can occupy the setting. Although it can be argued that long-term changes in BpS would occur due to changes in climate, there is very little information to base any predictions of change on and the degree of change within the time frame stated above for this analysis can be expected to be very small. Therefore BpSs would not change for this analysis.

We discuss the current and future conditions for the landscape in terms of changes in vegetation-fuel classes for each BpS. Table 5 displays the current (Cur) and desired (Ref) percent of BpS in each vegetation-fuel setting in the Stonewall Vegetation Project area (Milburn 2009). The mountain pine beetle mortality is ongoing and changes in the vegetation-fuel classes caused by the epidemic are continuing.

Table 5 cells that are colored red and orange are BpS/vegetation-fuel class combinations that are under-represented on the landscape and those that are yellow and green are over-represented, and white is close to that desired.

Table 5. Current and desired vegetation-fuel classes by BpS

BpS	AESP Cur/ Desired	BMSC Cur/ Desired	CMSO Cur/ Desired	DLSO Cur/ Desired	ELSC Cur/ Desired
Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	2/15	31/25	4/20	8/25	55/15
Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	1/15	35/25	5/20	10/25	50/15
Ponderosa Pine-Douglas-fir	1/15	31/10	0/25	1/40	67/10
Interior West Lower Subalpine Forest	1/20	21/40	7/10	25/5	46/25
Interior West Upper Subalpine Forest	0/20	22/25	11/25	22/15	46/15

Green – Very High (Greater than or equal to 180 percent of desired)
Yellow – High (Greater than desired but less than 180 percent of desired)
No Color – Close (Within 20% of desired)
Orange – Low (Greater than or equal to 20 percent 0f desired but less than desired)
Red – Very Low (less than 20 percent of desired)
AESP- Early-seral
BMSC- Mid-seral Closed canopy
CMSO- Mid-Seral Open canopy
DLSO- Late-seral Open canopy
ELSC- Late-seral Closed canopy

To achieve the desired vegetation-class composition on the landscape we can conclude from table 5 the following needs by BpS:

- Douglas-fir Interior Northern and Central Rocky Mountains (Dry) – move late-seral closed canopy into early-seral and late-seral open canopy and move mid-seral open canopy to mid-seral open canopy
- Douglas-fir Interior Northern and Central Rocky Mountains (Moist) – move late-seral closed canopy into early-seral and late-seral open canopy and move mid-seral open canopy to mid-seral open canopy
- Ponderosa Pine-Douglas-fir – move late-seral closed canopy into early seral and late-seral open canopy and move mid-seral open canopy to mid-seral open canopy
- Interior West Lower Subalpine Forest – move late-seral closed canopy into early-seral

Insects and Diseases

Bark beetles and defoliating insects have substantially impacted conifer forests in the project area, as in many other locations in the intermountain western states in recent years. The insects of primary concern in the project area are mountain pine beetle (*Dendroctonus ponderosae*), Douglas-fir beetle (*Dendroctonus pseudotsugae)* and western spruce budworm (*Choristoneura occidentalis*) although other bark beetles and defoliators are recorded as affecting forests in the area. We can also expect a number of diseases generally found in the forest types represented can be found in the project area. Stand data indicates armillaria root rot (*Armillaria ostoyae*) and lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) are present in some stands. White pine blister rust (*Cronartium ribicola*) is certainly also present in the whitebark pine.

Annual aerial insect and disease detection surveys (ADS) show areas affected by mortality attributed to mountain pine beetle and defoliation of Douglas-fir and true firs attributed to western spruce budworm have greatly increased since 2001 (table 6). Table 6 shows the acres within the Stonewall project area on which mortality was recorded, but does not directly display the magnitude of the mortality or defoliation. Douglas-fir beetle mortality was shown on a relatively small acreage.

The ADS flights did not cover the project area in the years 2004 and 2007. Areas mapped in each year's aerial survey show mortality considered to have occurred in the year before the flight, defoliation is recorded in the year of the flight. Each survey indicates the general magnitude and location of new mortality and damage. Each year's mapped mortality and damage can be new pockets of mortality or damage that do not overlap previously mapped areas, or can be ongoing mortality or damage in an area mapped in previous years. The acreage values by a single damage-causing agent are not accumulative over years, nor can acreage be summed for all agents in each year because areas of damage or mortality per agent can overlap in any year. The surveys show greatly increased acreage of mountain pine beetle mortality since 2002 and increased acreage of western spruce budworm defoliation since 2006.

Table 6. Aerial Detection acres of mortality (M) and defoliation (D) in project area by year

Year	2001	2002	2003	2005	2006	2008	2009	2010
Damage Causal Agent	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
Mountain pine Beetle (M)	94	30	2,373	1,063	2,554	11,154	19,403	12,859
Douglas-fir beetle (*Dendroctonus pseudotsugae*) (M)	133	117	69	131	46	33	9	2
Western balsam bark beetle (*Dryocoetes confusus*) (M)	32	30	2	320	31			
Hemlock looper (*Lambdina fiscellaria lugubrosa*) (D)	198	26	2084					
Western spruce budworm (D)						2,393	13,765	1,483
Subalpine fir mortality (M)								6

M – Mortality, D - Defoliation

The ADS annual estimated numbers of dead trees per acre (TPA) in an area can be summarized to give general accumulative magnitude and location of mortality due to a prolonged bark beetle event. Tree mortality and damage for proposed units was also assessed during site visits and is discussed below.

In

figure 8, we display a map of accumulated TPA mortality by TPA class. In table 7 we display acres and proportion of project area by accumulated estimated TPA mortality. Over one-half of the project area has greater than an estimated 10 TPA in mortality (estimated from 2001 to 2010).

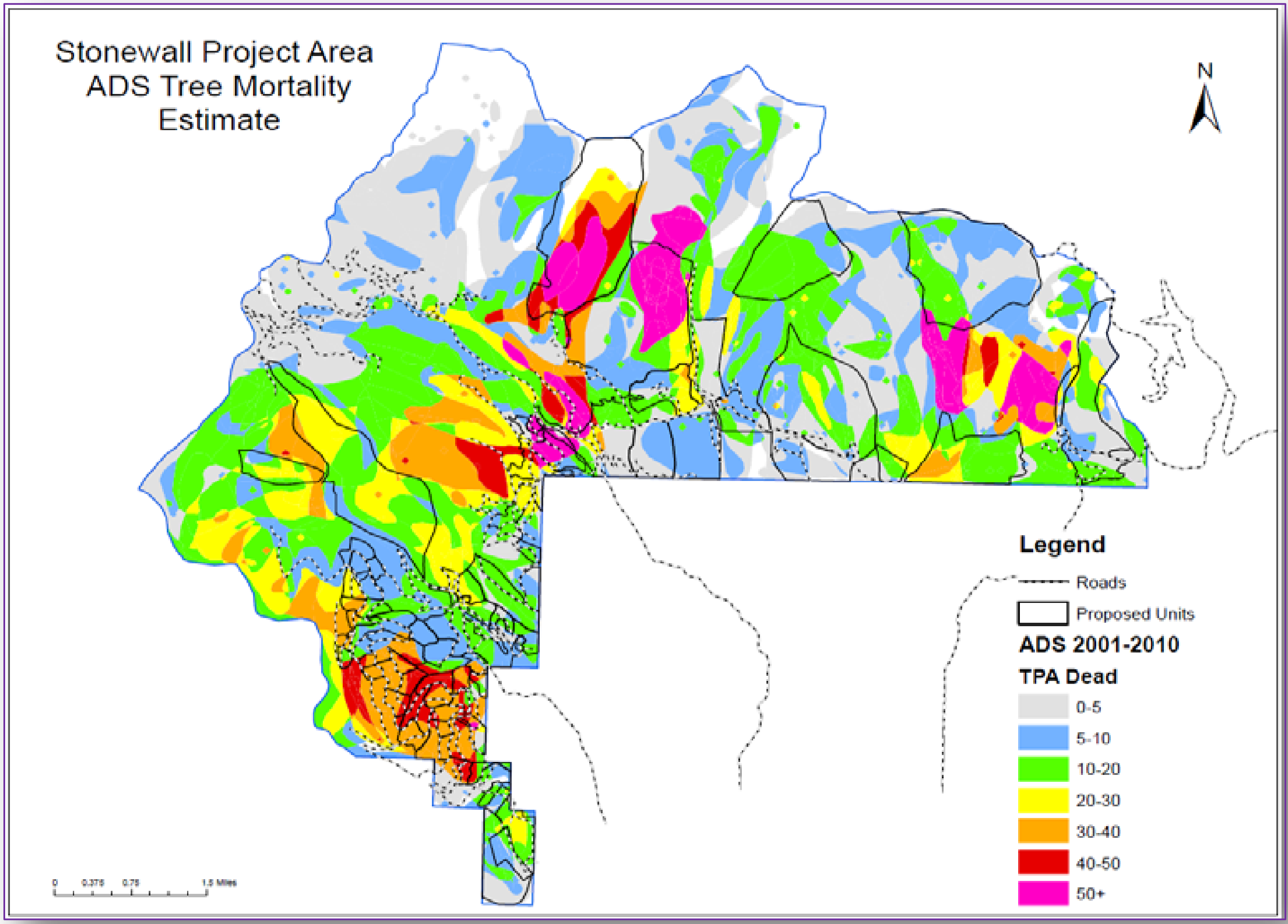

Figure 8. Aerial Damage Survey tree mortality estimates summed from 2001 to 2010

Table 7. Accumulated TPA mortality from ADS 2001-2010

TPA Mortality Class	Acres	Percent Of Project Area
0-5	3,514	15
5-10	5,602	23
10-20	6,195	26
20-30	2,826	12
30-40	1,974	8
40-50	766	3
50+	1,368	6

Horizontal Diversity

Desired conditions stated above include a relatively high degree of horizontal structural diversity, that is, patchiness within stands and over the landscape. As a result of fire exclusion, areas that were maintained by relatively low-intensity fires have become more homogenous (Milburn et al. 2006).

Figure 9displays the percent of area by tree canopy cover class from VMAP data, and figure 10 displays the spatial location of the tree canopy cover classes. The canopy cover distribution displayed in figure 9 is relatively narrow, with over 60 percent of the area within the 25-39.9 percent canopy cover class, and about 82 percent of the area is within or above that class. The VMAP data was edited by Helena National Forest personnel to account for the recent bark beetle mortality. VMAP data preceding the bark beetle epidemic shows a similar narrow range with the peak in the 40-59.9 percent class with over 79 percent within or above that class. In addition, we noted most of the shrub cover and a portion of the herb cover in the classification are in young tree plantations, and a large portion of the herb cover is in an area burned in 2003 by the Snow/Talon Fire that was forested prior to the fire. In general, figure 10 shows a landscape relatively uniformly covered by forest with little horizontal structural diversity both within stand and over the landscape.

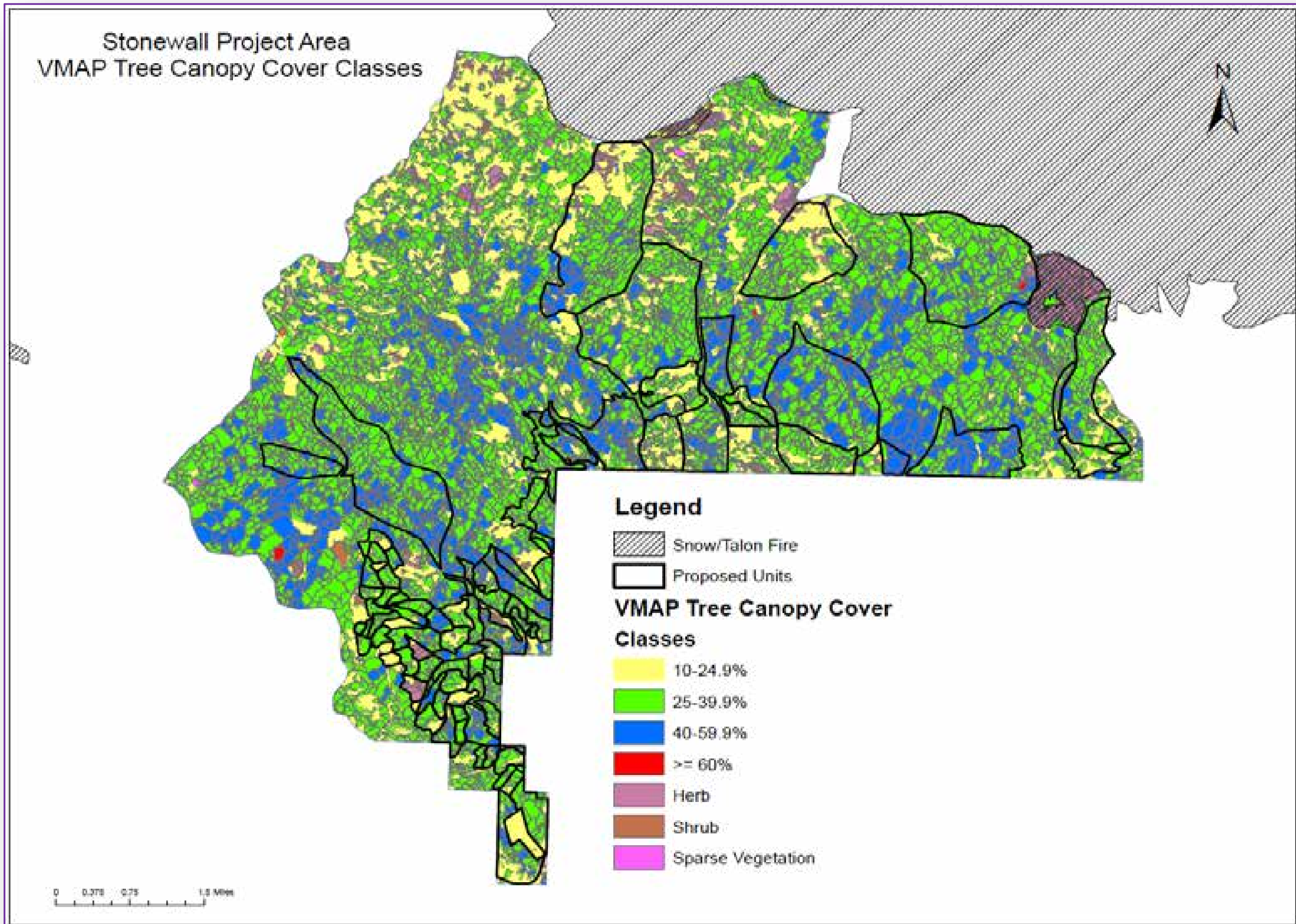

Figure 9. Percent of project area in tree canopy-cover classes

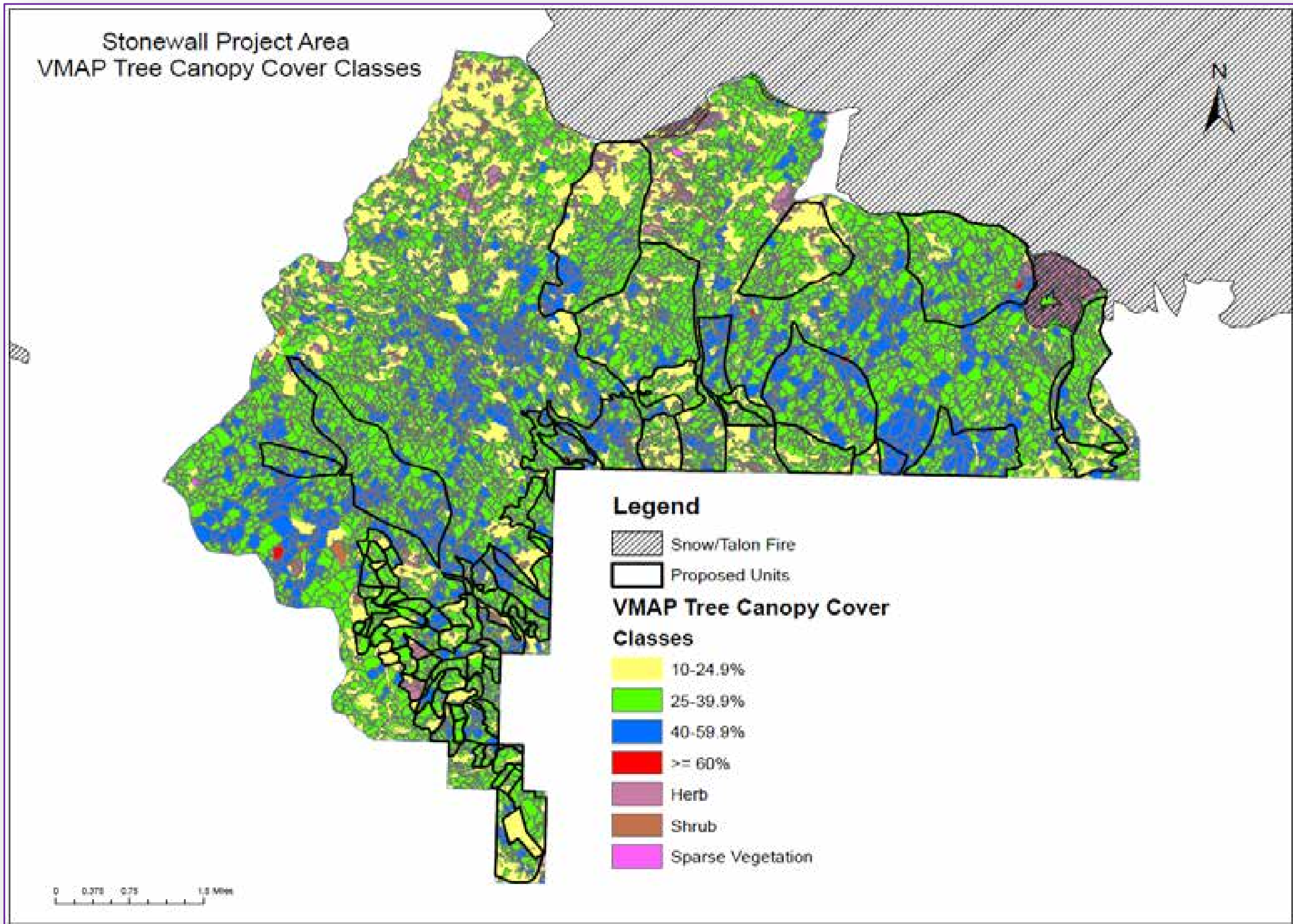

Figure 10. VMAP tree canopy-cover classes

Proposed Action

The proposed action includes using commercial and noncommercial treatments on approximately 8,560 acres (36 percent) of the 24,010-acre project area to move towards desired conditions. These actions include: regeneration harvest, intermediate harvest, precommercial thinning, and prescribed burning. Treatments are briefly described by "group."

Group 1: Intermediate Harvest to Promote Mature Open Forests
Group 2: Intermediate Harvest to Thin Young Forests
Group 3: Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees
Group 4: Regeneration Harvest in Areas of High Mortality Retaining Rare Live Trees
Group 5: Intermediate Harvest to Remove Minor Amounts of Dead/Dying Trees
Group 6: Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 acres
Group 7: Mixed Severity Fire to create mortality patches up to 5, 10, or 20 acres
Group 8: Mixed severity fire to create mortality patches up to 30 or 75 acres

The proposed action includes using prescribed fire and tree slashing in two roadless areas, Bear-Marshall-Scapegoat-Swan and Lincoln Gulch. Figure 13 displays the proposed activities in relation to inventoried roadless areas. More detailed treatment descriptions are found in chapter 2 and appendix B. Outside the roadless areas, approximately 2.6 miles of road would be built then obliterated immediately following timber removal. Commercial timber harvest and road construction would not occur in the two roadless areas.

Implementing the proposed action could include the use of chainsaws, feller-bunchers, and cable logging equipment. Post treatment activities would include underburning, site preparation burning, jackpot burning, hand piling and burning, tree planting, and monitoring of regeneration. In all the areas proposed for burning, the opening size may exceed 40 acres due to the amount of mortality created by the bark beetles and the resulting need for regeneration. Proposed regeneration harvest units exceed 40 acres in seven units. All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size.

Development of the Proposed Action

The Lincoln Restoration Committee (LRC) of the Montana Forest Restoration Committee (MFRC) is a group of private citizens with diverse community interests who came together in 2008 with the purpose of developing recommendations for restoration projects on the Lincoln Ranger District, while working within the framework developed by the MFRC. The Helena National Forest has been working with the LRC in compliance with Executive Order 13352 of August 2004—Facilitation of Cooperative Conservation. The proposed action was developed over time as three areas. Two areas were brought forward to the Forest Service by the LRC, formerly the Lincoln Working Group, and the third area was developed after Forest Service specialists reviewed conditions within the entire watershed (Cole 2009a, b; Cole 2010; Farley 2009; Heinert 2009a, b; Ihle 2010; Kurtz 2009; Lundberg and Alvino 2006; Marr 2009; Milburn et al. 2006; Milburn 2009; Olsen 2010a, b, c; Randall 2009; Shanley 2009, 2010; Sitch 2009; USDA Forest Service 2010; Walch 2010; Wyatt 2009). This analysis covers all three areas. The recommended actions associated with the three areas are consistent with the goals in the Forest Plan. (see table 1 Crosswalk of MFRC Principles with Forest Service Direction

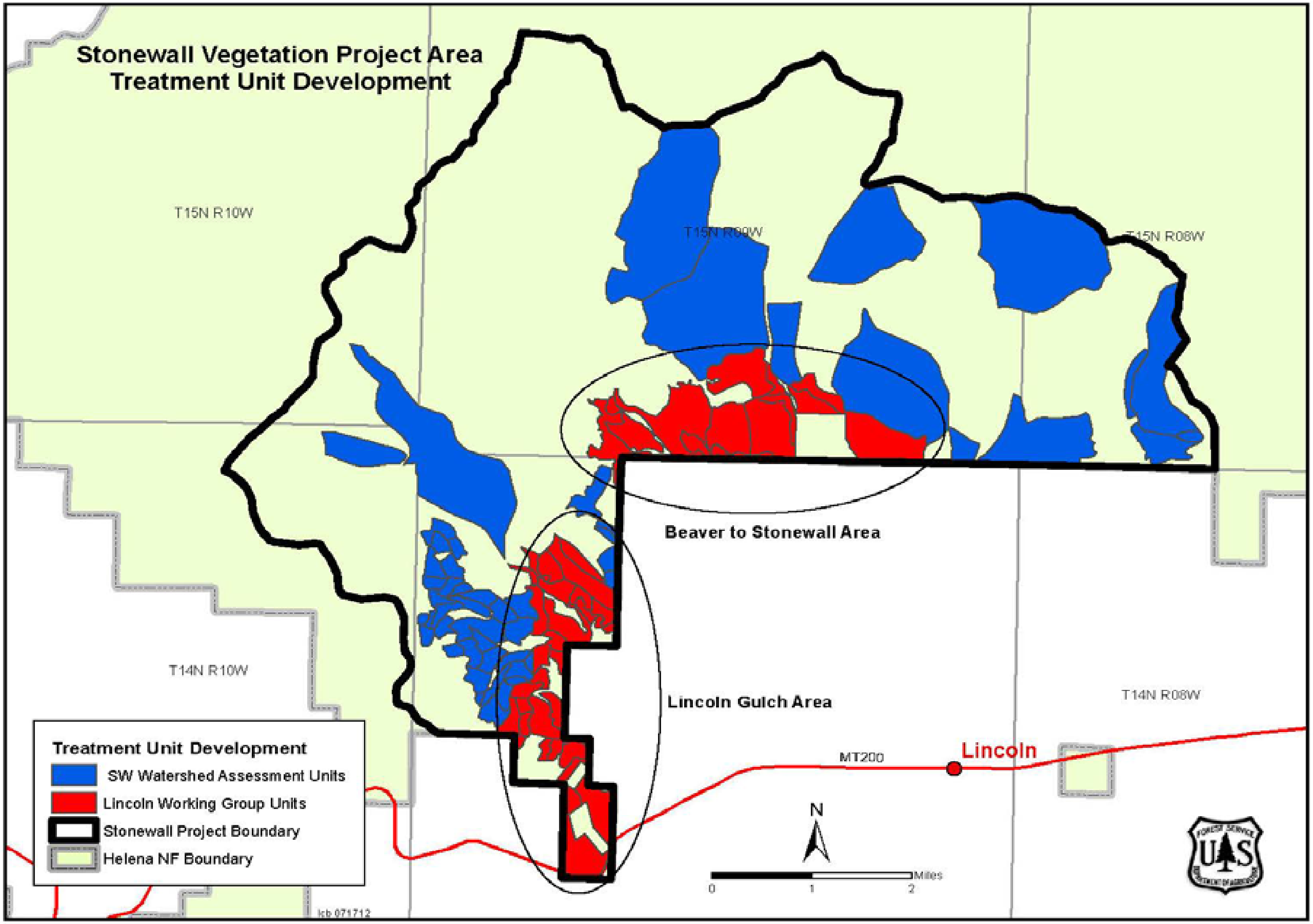

Figure 11. Alternative 2 – proposed action, treatment unit development map

The first area recommended by the LRC to the Forest Service was called "Lincoln Gulch Fuels Reduction and Forest Restoration." The LRC chose to focus on the Lincoln Gulch area for their first recommended project because they felt it offers opportunities for restoration work benefitting ponderosa pine, quaking aspen, fish and wildlife habitat, and separately, fuels reduction in proximity to private residences. Recommended treatments were built with consensus to meet multiple goals consistent with the 13 Montana Forest Restoration Committee principles. The LRC spent almost 1 year, including field verification, devoted to assessing where and how these principles might be applied in ways that are beneficial to the Lincoln community, the broader public, and the health of the land. Their recommended treatments include prescribed fire, ponderosa pine and aspen restoration, and fuels reduction. This area includes approximately 1,049 acres of total treatment (figure 11).

The second area recommended to the Forest Service is called "Beaver to Stonewall" or "Project 2". The LRC, in looking for another area to apply principles for restoration, adopted a process recommended by The Wilderness Society where specific criteria were utilized using a mapping technique to locate where low-severity fire regime and the presence of ponderosa pine occurred. This area was identified and endorsed by the LRC after a field trip to verify the sites met their restoration goals and had a need for restoration treatment. The recommended treatments were similar to Lincoln Gulch, benefiting ponderosa pine, aspen, fish and wildlife habitat, and separately, fuels thinning in proximity to private land. This area includes approximately 1,240 acres of total treatment (figure 11).

In addition to the restoration recommendations from the LRC the Helena National Forest identified restoration needs and opportunities based on information from field reviews and surveys within the greater watershed area (Cole 2009a, b; Cole 2010; Farley 2009; Heinert 2009a, b; Ihle 2010; Kurtz 2009; Lundberg and Alvino 2006; Marr 2009; Milburn et al. 2006; Milburn 2009; Olsen 2010a, b, c; Randall 2009; Shanley 2009, 2010; Sitch 2009; USDA Forest Service 2010; Walch 2010; Wyatt 2009). The developed proposed actions were found to be consistent with the Helena National Forest's Land Management objectives in the Helena National Forest Plan (figure 11).

The findings from the field reviews and surveys within the greater watershed area included declines of ponderosa pine, western larch, and aspen habitats, elevated fuels in the wildland urban interface, and a landscape-level departure from natural fire processes. The fire risk and fuels concerns for this area were also identified in the Community Wildfire Protection Plan (Tri-County Fire Working Group 2005) as the highest priority need for treatment. After the 2003 Lincoln Complex Fires that burned approximately 36,000 acres and required a partial evacuation of the community of Lincoln, residents expressed a desire to see forest management designed to reduce the risk of future catastrophic events.

In addition, a Forestwide landscape-level assessment of insect conditions and predictions was done in 2008 (Kamps et al. 2008) which identified the Stonewall area as a high priority for management. The Lincoln community is very aware of the mountain pine beetle epidemic and high levels of western spruce budworm activity across the landscapes in the Upper Blackfoot Valley and west side of the Continental Divide.

Preliminary issues considered during development of the proposed action included restoration of vegetation communities, potential impacts to grizzly bear and lynx habitat, reduction of fuels and wildfire hazard risks, and potential impacts to habitats including ponderosa pine, western larch and aspen.

Benefits anticipated as an outcome of proposed actions include: restoration of ponderosa pine, dry Douglas-fir, and western larch sites to a more natural fire regime; maintain or improve vigor and restore aspen groves; and enhance wildlife habitat conditions.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, and the environmental consequences in order to make the following decisions:

- Whether or not to implement the proposed action or an alternative to the proposed action and appropriate mitigation
- What monitoring requirements are appropriate to evaluate implementation of this project
- Whether a Forest Plan amendment is necessary e.g. reductions in big game habitat

Public Involvement

The Notice of Intent (NOI) was published in the Federal Register on January 13, 2010 (75 FR 1748). The NOI asked for public comment on the proposal to be received by February 22, 2010. The agency sent about 700 letters explaining the proposal and asking for comment to interested individuals, groups and agencies on January 15, 2010. In addition, as part of the public involvement process, we held an open house on February 3, 2010, and project information was available on the Forest website at www.fs.usda.gov/helena . The project has been listed in the Forest's Schedule of Proposed Actions since April 1, 2010.

The DEIS Appendix A included the content analysis of the scoping comments received.

We received a total of 80 scoping responses via email, public comment form and letters; 30 were in support of the proposed project activities. The majority of responses suggested information to include in the analysis documents, identified language to clarify, or listed elements pertaining to a specific resource to include in the effects analyses. The resource specialists' reports include this information as well as the analysis of the project effects on the various resources. The resource specialists' reports are filed in the project record and incorporated by reference and summarized in Chapter 3 – Affected Environment and Environmental Consequences, of this EIS.

Eight responses expressed concerns or suggestions regarding management of area roads and motorized, winter recreation opportunities. The Stonewall Vegetation Project is not a travel planning project and does not propose to change the permanent road system in the project area. Travel management of existing routes is addressed in the "Blackfoot-North Divide Winter Travel Plan" and the "Blackfoot Travel Plan (Non-Winter)" analyses.

A few responses included items of literature to be considered, some noted as opposing science information. As part of the analysis for this project, resource specialists reviewed and considered relevant scientific literature, including submitted articles. The literature review is included in the project record and posted on the forest website at www.fs.usda.gov/helena/

Using the comments from the public, and other agencies the interdisciplinary team developed a list of issues to address.

The Notice of Availability of the DEIS was published in the *Federal Register* on May 3, 2013 (78 FR 26027). The Notice of Availability started the 45-day comment period on the DEIS. We sent about 240 letters and electronic mail attachments announcing the availability of the DEIS to interested and affected individuals, groups and agencies on April 30, 2013. A legal notice announcing the opportunity to comment on the Stonewall Vegetation Project DEIS was published in the *Helena Independent Record* on May 6, 2013.

Appendix A of this FEIS lists the names of the individuals, organizations, and agencies that provided comments during the opportunity to comment period for the DEIS for the Stonewall Vegetation Project, on the Helena National Forest. Appendix A includes a copy of the letters received commenting on the DEIS, followed by the Forest Service response.

Issues

All of the comments received as a result of scoping and meetings were reviewed by the interdisciplinary team and Responsible Official and used to identify those which may have a significant cause-effect relationship with the proposal. Specialists analyzed effects in their report comparing trade-offs for the decision-maker and public to understand. These issues were used to:

- ♦ Formulate alternatives
- ♦ Prescribe specific design feature to reduce undesired effects, or
- ♦ Provide clarification in specialist reports or evaluate the comparative merits of the effects of alternatives

Formulate Alternatives

These are issues regarding the action and its effects on a particular resource or group of resources that are unresolved or renders the action less effective in accomplishing the purpose and need for this project.

Wildlife Habitat: Proposed vegetative removal and burning treatments may reduce the quality change structure and composition of vegetation or availability of habitat for threatened, endangered and sensitive species and designated critical habitat; management indicator species (MIS); big game hiding cover, thermal cover, and security cover. The public expressed concern with fragmentation of habitat from roads (habitat connectivity) and viability of old-growth and snag-dependent species.

Indicators:

- Changes in security cover and potential conflicts with humans. Core habitat, Open Road Density (ORD) and Total Road Density (TRD) are specific measures used to evaluate changes within the grizzly bear management units (Arrastra and Red Mountain) that overlap the project area.
- Habitat suitability changes within the Lynx Analysis Units (LAUs bl-7 and bl-8) Acres of lynx habitat affected is evaluated according to the Northern Rocky Mountain Lynx Management Direction (NRMLMD) standards and guidelines.
- Changes in availability of the number of snags and tons of downed woody debris
- Acres of suitable MIS and sensitive species habitat impacted
- Acres of elk hiding cover, thermal cover, and security habitat within the project area and elk herd units
- Maintaining or providing habitat connectivity

- Acres of old growth affected and effects to snag-dependent species

Addressed by Design Features or Evaluated for Comparison

In addition to the issue identified above, we analyzed the effects of the proposed action and alternatives based on implementing design criteria and disclose the differences of effects between alternatives for the following:

40-Acre Opening Limit: Proposed regeneration harvest units exceed 40 acres in seven units (appendix L). All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size.

Weed Spread/Infestation: Proposed actions, including harvest disturbance and use of haul routes in areas with weeds present, may disturb landscapes allowing existing weed populations to expand or allowing additional species to become established.

Treatment of existing weed infestations would occur under the guidance of the Forestwide effort and treatments to prevent the spread of weeds is included in design features to reduce potential spread.

Indicators:

- Predicted acres of noxious weed infestation due to the proposed treatments;
- Associated management cost for weed control activities.

Use of roads that would be built then obliterated immediately following timber removal, and use of existing roads: Comments indicated concern that roads built then obliterated immediately following timber removal, road reconstruction, and use of existing roads would adversely impact soils through compaction, water quality and fisheries through sedimentation, and associated wildlife habitat.

Indicators:

- Existing road mileage and road density within the project area
- Proposed activities involving the existing transportation network for project implementation

Amount of Prescribed Fire: Concern that the Forest Service has limited experience implementing prescribed fire in mixed-severity fire regimes. Concern with the amount of acres proposed for prescribed burning; proximity to private land and timing of burns introduce risk to private lands (e.g., loss of homes, buildings, smoke effects to air quality).

Pretreating areas with vegetation removal adjacent to private land boundaries is designed to remove potential fuels prior to prescribed burning. Pile burning is proposed to more closely manage areas to receive active burning.

Indicators:

- Acres of prescribed fire immediately adjacent to private land and the qualitative values of risk and potential consequences

- Acres of prescribed fire by fire regime within the project area
- Acres and type of pretreatment prior to use of prescribed fire
- Estimated emissions from burning

Other Issues

There were also other comments and nonsignificant issues categorized as: (1) outside the scope of the proposed action, or decision to be made; (2) already decided by law, regulation, Forest Plan, or other higher-level decision; (3) comments pertaining to disclosing the effects to various resources, which are addressed by the specialists' analyses and the discussions in the draft environmental impact statement (DEIS); or (4) comments in support of the project.

The Council on Environmental Quality (CEQ) NEPA regulations explain this process in 40 CFR 1501.7, "There shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" and in converse the CEQ further suggests "Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…." Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition.

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Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Stonewall Vegetation Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., building roads then obliterating versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion caused by helicopter logging versus skidding).

Alternatives Considered in Detail

The Forest Service developed three alternatives, including the no action and proposed action alternatives, in response to issues raised by the public. Table 8 displays treatments proposed by alternative.

Alternatives at a Glance

Table 8. Treatment Summary by Alternative

GROUP #: BRIEF TREATMENT DESCRIPTION HARVEST TREATMENT, FUELS TREATMENT	**ALT. 1 NO ACTION ACRES**	**ALT. 2 ACRES**	**ALT. 3 ACRES**
Group 1: Intermediate Harvest to Promote Mature Open Forests	**0**	**974**	**232**
Improvement Cut, Jackpot Burn	0	36	0
Improvement Cut, Underburn	0	938	232
Group 2: Intermediate Harvest to Thin Young Forests	**0**	**1,132**	**822**
Precommercial Thin	0	523	409
Precommercial Thin, Handpile Underburn	0	0	29
Precommercial Thin, Handpiling, Burn Piles	0	78	50
Precommercial Thin, Underburn	0	289	141
Precommercial Thin, Underburn or Slash Treatment along PVT	0	242	193
Group 3: Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees	**0**	**745**	**664**
Seedtree with Reserves, Broadcast Burn	0	29	29
Seedtree with Reserves, Jackpot Burn	0	73	41
Seedtree with Reserves, Slashing, Handpiling, Burn Piles	0	18	18
Seedtree with Reserves, Underburn	0	223	207
Shelterwood (Group) with Reserves, Jackpot Burn	0	137	137
Shelterwood (Group) with Reserves, Site Prep Burn	0	96	96
Shelterwood (Group) with Reserves, Slashing, Handpile/Burn	0	25	0

GROUP #: BRIEF TREATMENT DESCRIPTION HARVEST TREATMENT, FUELS TREATMENT	**ALT. 1 NO ACTION ACRES**	**ALT. 2 ACRES**	**ALT. 3 ACRES**
Shelterwood (Group) with Reserves, Underburn	0	114	114
Shelterwood with Reserves, Site Prep Burn	0	30	22
Group 4: Regeneration Harvest in Areas of High Mortality Retaining Rare Live Trees	**0**	**223**	**152**
Clearcut with Reserves, Broadcast Burn	0	98	80
Clearcut with Reserves, Jackpot Burn	0	53	0
Clearcut with Reserves, Site Prep Burn	0	54	54
Clearcut with Reserves, Underburn	0	18	18
Group 5: Intermediate Harvest to Remove Minor Amounts of Dead/Dying Trees	**0**	**25**	**25**
Sanitation, Slashing, Handpiling, Burn Piles	0	25	25
Total Harvest Treatments (acres)	**0**	**3,099**	**1,895**
Group 6: Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 acres	**0**	**449**	**326**
Low Severity Fire, Openings <5 acres	0	326	326
Low Severity Fire, Openings <10 acres	0	123	0
Group 7: Mixed Severity Fire to create mortality patches up to 5, 10, or 20 acres	**0**	**410**	**36**
Mixed Severity Fire, Openings <5 acres	0	36	36
Mixed Severity Fire, Openings <10 acres	0	48	0
Mixed Severity Fire, Openings <20 acres	0	326	0
Group 8: Mixed severity fire to create mortality patches up to 30 or 75 acres	**0**	**4,604**	**3,265**
Mixed Severity Fire, Openings <30 acres	0	3371	2032
Mixed Severity Fire, Openings <75 acres	0	1233	1233
Group 9: Low Severity Prescribed Fire	**0**	**0**	**638**
Jackpot Burn	0	0	326
Underburn	0	0	312
Group 10: Intermediate Harvest to Promote Mature Open Forests	**0**	**0**	**403**
Improvement Cut and Leave, Jackpot Burn			**403**
Grand Total Project Treatments (acres)	**0**	**8,564**	**6,564**
Logging Systems			
Tractor logging (total acres)	0	1,944	1,246
Skyline logging (total acres)	0	663	364
Hand treatments Intermediate Harvest – Precommercial Thin (acres) Prescribed fire (acres)	 0 0	 493 5,463	 285 4,668
Burning Treatments			
Total area proposed for burning treatments (acres)	0	8,039	6,155
Total acres proposed for burning in designated IRAs	0	4,846	3,565
Roads			
Roads Built for Project Use then Obliterated (miles)	--	2.6	0.4
Road Maintenance (miles)	--	45.6	43.8
Total Road Miles Used	--	48.2	44.2
Timber Volume (Ccf)	--	22,022	14,299

Alternative 1 – No Action

Under the no-action alternative, current management plans would continue to guide management of the project area. No timber removal, fuels reduction, or prescribed burning for forest restoration would be implemented to accomplish project goals.

Alternative 2 – The Proposed Action

This alternative represents the proposed action from scoping. Mapping corrections resulted in slight adjustments in acre and mile figures from scoping.

Alternative 2 proposes a total of 8,564 acres of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 3,099 acres. Proposed regeneration harvest units exceed 40 acres in seven units (appendix L). All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size. Fuels treatments would follow timber removals, including slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is proposed within the inventoried roadless areas (IRA) to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on approximately 4,182 acres (about 0.5 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Areas and on 664 acres (about 3.8 percent) within the Lincoln Gulch Inventoried Roadless Areas. To help facilitate management, outside of these IRAs approximately 2.6 miles of road would be built then obliterated immediately following timber removal.

Figure 15 displays the proposed action with INFISH (1995) buffers. This alternative represents the proposed action from scoping. Mapping corrections resulted in slight adjustments in acre and mile figures from scoping. Project design features are displayed in table 9.

Treatment Descriptions

This section explains the treatments proposed for alternative 2 – proposed action by groups. See figure 13 for a visual display.

Group 1. This group includes 18 treatment units comprising about 974 acres. Treatment objectives for this group are to develop mature, open forests comprised mostly of fire-resistant species. The proposed treatments would thin live trees, remove dead trees, and prescribe burn surface fuels. All tree thinning would be "from below" to favor retaining larger trees over smaller trees except that thinning regimes would favor retaining smaller trees of a more desirable species over larger trees of a less desirable species, and would favor keeping smaller, healthier and disease-free trees over larger, diseased trees. In general, the species preference for retention would be aspen, western larch, ponderosa pine, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir in descending order. This general order of preference may be modified for individual stands to address management objectives such as retaining species diversity, site factors, and other stand-specific factors such as relative species presence as noted in individual stand/unit prescriptions.

Trees would be thinned to an average spacing of 20 to 40 feet (109 to 27 TPA), but spacing could vary widely. Thinning would be by hand or machine.

All cut, live trees of a merchantable size would be removed for utilization. All merchantable dead trees would be removed, except those needed to meet other resource concerns (e.g., snag and downed large woody debris requirements).

Following thinning and removal, units would be underburned or jackpot burned to reduce fuels.

Group 2. This group includes 25 treatment units comprising about 1,132 acres. Treatments would thin small-diameter trees of little to no merchantable value. The thinning regime would generally be as described above for Group 1, except that post-thinning average tree spacing would range from 12 to 20 feet (109 to 303 TPA). Thinning would be by hand and/or machine, depending upon tree size. In several units, thinning slash would be piled by hand and burned.

Group 3. This group includes 19 treatment units comprising about 745 acres. Treatments proposed are seedtree and shelterwood harvest/regeneration systems (appendix B). Most trees, except as needed for shelter and seed production would be removed. In some of the shelterwood treatments, trees would be retained in groups; in others the remaining trees would be relatively evenly distributed. All cut, live trees of a merchantable size would be removed for utilization. All merchantable dead trees would be removed, except those needed to meet other resource concerns (e.g., snag and downed large woody debris requirements). Many of the units would be burned to reduce fuel loads and prepare sites for natural regeneration or planting. Many of the units may be planted with some combination of ponderosa pine, Douglas-fir, and western larch where needed to regenerate the stands to the desired seral and fire-resistant species.

Group 4. This group includes 11 treatment units comprising about 223 acres. Treatments proposed are clearcut harvest/regeneration systems in which all trees would be removed except for scattered clumps or individuals. Retained trees would mostly be Douglas-fir, ponderosa pine, or western larch. Remaining live and dead merchantable trees would be removed for utilization, except for those identified for other resource needs. Following cutting and removal, units would be prescribe burned, the type of burn varying by individual unit fuels reduction and site preparation treatment need. Natural regeneration by Douglas-fir and lodgepole pine is expected to occur to some degree and Douglas-fir, ponderosa pine, and western larch may be planted, the mixture differing by individual unit.

Group 5. This group includes two treatment units comprising about 25 acres. The treatments would remove dead and dying trees, slash non-commercial-sized trees, and reduce fuels by handpiling and burning. All cut merchantable trees would be removed for utilization using ground-based equipment except as needed to meet other resource concerns.

Group 6. This group includes three treatment units comprising about 449 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. The prescribed burning would create openings less than 5 or 10 acres, the opening size depending upon the unit. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and preparing sites for natural regeneration.

Group 7. This group includes three treatment units comprising about 410 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. Where the opportunity exists, small trees would be cut to create small openings around available whitebark pine, ponderosa pine, western larch, and Douglas-fir trees to enhance the regeneration of those species. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration.

The treatments would create patches of mortality up to 5, 10, or 20 acres depending upon the treatment unit.

Group 8. This group includes seven treatment units comprising about 4,604 acres. The treatments would cut small trees on portions of treatment areas to create fuelbeds conducive to low-intensity prescribed burning. Where opportunity exists, small trees would be cut to create small openings around available whitebark pine, ponderosa pine, western larch, and Douglas-fir to enhance regeneration of those species.

Figure 12. View looking towards units 88 and 84 proposed for group 8 treatment

Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration. The treatments would create patches of mortality up to 30 or 75 acres depending upon the treatment unit.

Aspen is in a number of units proposed for treatment. The aspen can be considered seral to either subalpine fir or Douglas-fir, depending upon the unit and site. In many unit exams, the aspen is simply recorded as being present, as rare, or as a trace; while in several other units it comprises a substantial, although still minor, portion of the stocking, for example Unit 3. Comments concerning the aspen in unit exams range from “suppressed in the understory” to “vigorous in the overstory, but proportionally not much suckering.” In general, we can characterize aspen in proposed units and the project area as (1) small clones, (2) heavily competing with—to suppressed by— conifers, and (3) a minor stand component (with a few exceptions).

Whitebark pine can be found in several units from Group 6, 7, and 8. In general, the whitebark pine in the project area is considered highly infected by white pine blister rust, and can be considered seral to subalpine fir. On sites where it is a seral species in the Northern Rocky Mountains, whitebark pine depends upon fire to maintain its dominance or presence (Arno 2001, Keane 2001, Kendall and Keane 2001, Morgan and Murray 2001). In the absence of fire, subalpine fir has increased in presence, and the combination of increased subalpine fir and whitebark pine mortality, and lack of regeneration due to white pine blister rust and mountain pine beetle have resulted in a decline in whitebark pin.

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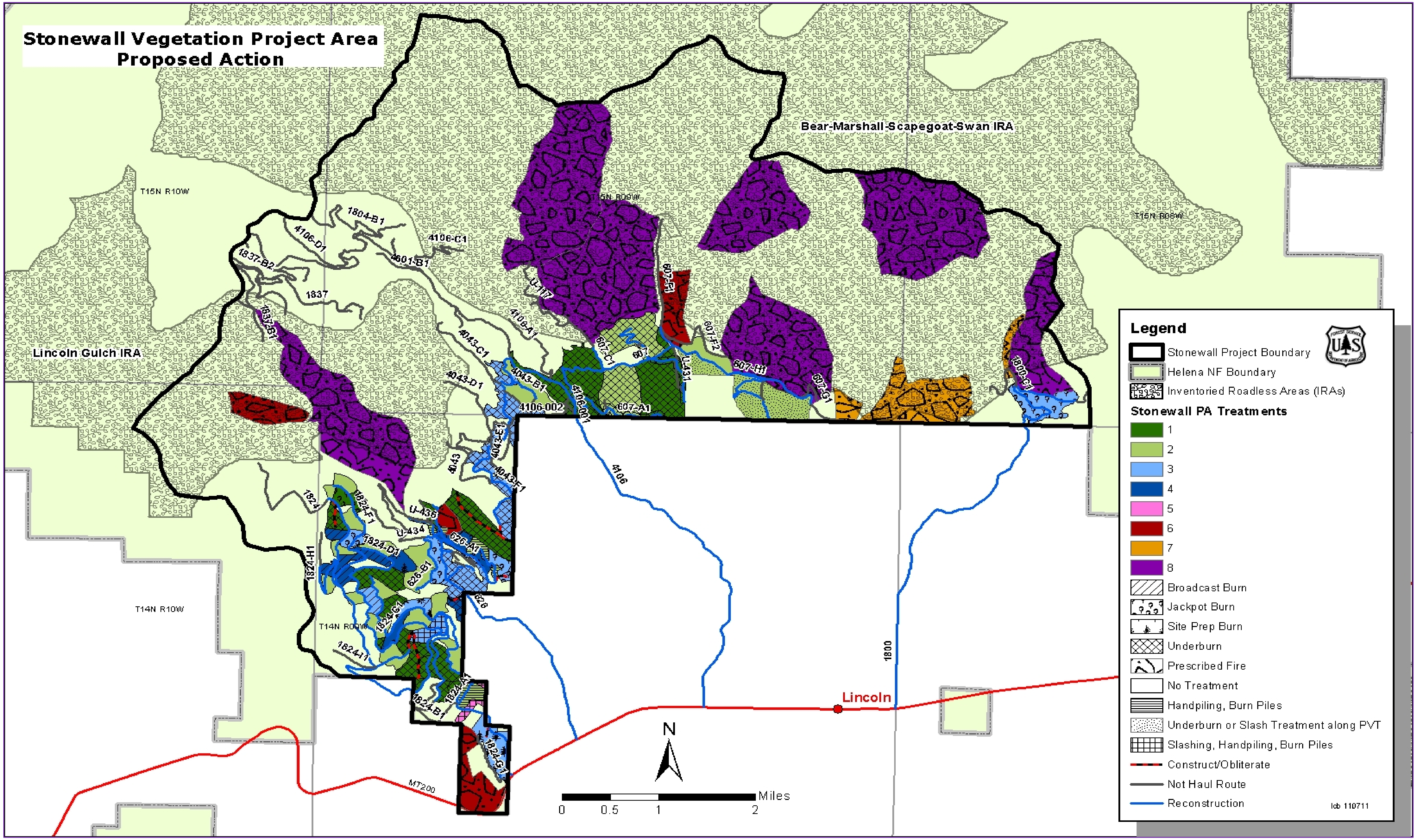

Figure 13. Alternative 2 – proposed action treatments

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Alternative 3

This alternative was developed to address issues raised during scoping regarding reducing potential impacts to habitat for threatened, endangered and sensitive species and designated critical habitat; management indicator species (MIS); big game hiding cover, thermal cover, and security cover. Treatments were reviewed and adjusted to reduce impacts to habitat (figure 14).

Alternative 3 proposes a total of 6,564 acres of commercial and noncommercial treatments. Harvest treatments (regeneration harvest, intermediate harvest, and precommercial thinning) are proposed on a total of 2,298 acres. Proposed regeneration harvest units exceed 40 acres in seven units (appendix L). All of the units have been severely impacted by recent mountain pine beetle mortality and are exempt from 60-day review and Regional Forester approval as described in FSM 1900-2006-2. (FSM R1 Supplement 2400-2001-2). The Stonewall Vegetation Project EIS 45-day comment period serves to notify the public and is sufficient in documenting the need for the unit size (See also Appendix B, page 230). Fuels treatments would follow timber removals and include slashing, pile burning, jackpot burning, and underburning. In addition to post-harvest burning, prescribed fire is proposed within the Bear Marshall Scapegoat Swan Inventoried Roadless Areas to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 3,565 acres (about 0.4 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Areas. The Lincoln Gulch Inventoried Roadless Areas would not be treated. To help facilitate management, outside the IRAs approximately 0.4 mile of road would be built then obliterated immediately following timber removal.

Figure 16 displays alternative 3 treatment units with INFISH buffers. Project design features are listed in table 9.

Treatment Descriptions

Groups 1-8. Under Alternative 3, treatments for units in Groups 1-8 would be the same as discussed above under Alternative 2. The treated areas would change from that discussed in Alternative 2 because under Alternative 3 several units are not proposed for treatment and 12 units are proposed for treatment under new groups—Groups 9 and 10. Treatment acreages for alternatives 2 and 3 are displayed in table 8.

Group 9. Under alternative 3, about 1,040 acres would be treated with a low-intensity and low-severity prescribed burn (underburn). The purposes of the underburn would be to reduce surface and ladder fuels (small trees) and so modify future fire behavior while minimizing impacts to stand overstory and mid-story stocking from the prescribed burn.

Group 10. This group includes units 46a and 47a. Treatments would be designed in a mosaic pattern to maintain cover and forage for wildlife while promoting ponderosa pine and aspen, and reducing ladder fuels. Portions of the stands would be thinned to (1) reduce understory competition from around large ponderosa pine trees, (2) thin heavily-stocked groups of trees on sites historically dominated by ponderosa pine, and (3) remove conifer competition from within and around quaking aspen. Treatment guidelines are as follows:

- Reduce understory competition around large ponderosa pine, move areas toward or maintain multi-storied ponderosa pine structure, within 50 feet of ponderosa pine trees larger than 17 inches d.b.h. remove all but two trees. Retained trees should be varied size and age classes.
- In areas dominated by ponderosa pine, but lacking live trees greater than 17 inches d.b.h., trees would be thinned to 48 to 109 trees per acre depending upon tree size.

- Ponderosa pine snags greater than 17 inches d.b.h. would be favored for retention to meet Forest Plan direction for snags.
- Conifers less than 17 inches d.b.h. would be removed up to 100 feet of existing aspen patches.
- Post-thinning, slash would be jackpot burned or hand-piled and burned to reduce fuels.
- Treatments would affect up to 50 percent of these units.

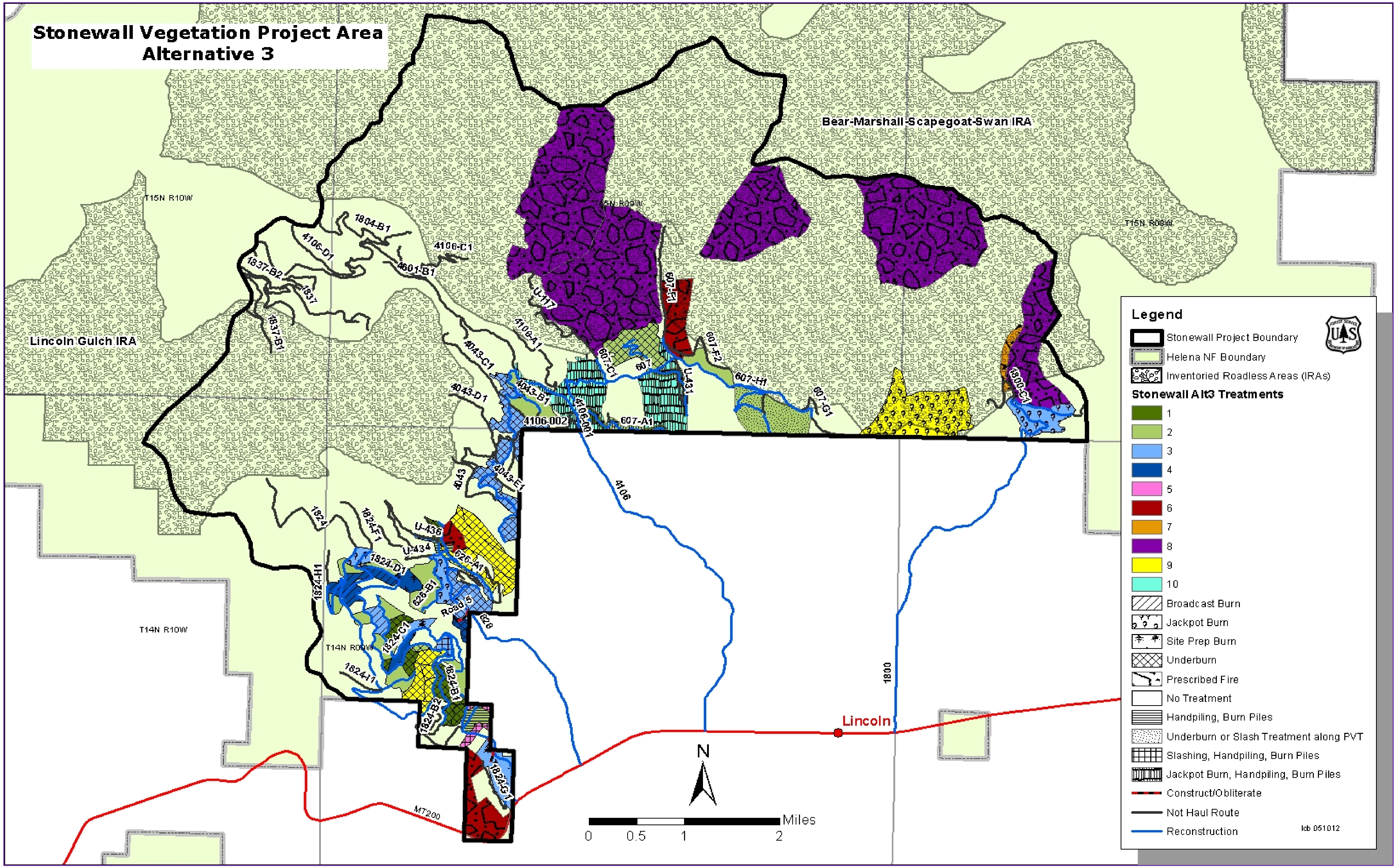

Figure 14. Alternative 3 treatments

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Big Game Habitat Non-Significant, Site-Specific Amendment

Helena National Forest Land and Resource Management Plan Non-significant, Site-Specific Forest Plan Amendment - Stonewall Vegetation Project Amendment

Purpose and Need

Active management is necessary to address fuel loading, species diversity, and insect and disease concerns. Due to the predominance of mature forest, limited disturbance, and reduced forage in this project area, some management is necessary to maintain herd health and increase elk populations within the elk management units (MFWP 2004). Collectively, the treatments proposed under the action alternatives are designed to address these concerns. The long-term benefits associated with the increased forage availability and reduced wildfire risks should outweigh the risks associated with the anticipated reduction in cover under either action alternative (alternatives 2 and 3).

Exemptions

The Helena National Forest is amending the 1986 Helena National Forest Plan (Forest Plan) for lands encompassed by the Stonewall Vegetation Project. This site-specific amendment would exempt the Project from:

- Forestwide Standard 3 for hiding cover on summer range (Forest Plan p. II/17) for the Beaver Creek and Keep Cool Creek elk herd units and thermal cover on winter range in the Beaver Creek herd unit
- Forestwide Standard 4a for open road densities during the big game hunting season (Forest Plan p. II/17-18) for the Beaver Creek and Keep Cool Creek elk herd units
- Management Area T-2 standard for thermal cover on winter range (Forest Plan p. III/35) within the management area
- Management Area T-3 standard for hiding cover (Forest Plan p. III/39) within the management area
- Management Area T-2 and T-3 standards for hiding cover in timber harvest openings (Forest Plan III/35 and III/39).

The hiding cover and thermal cover standards in Management Area W-1 (Forest Plan p. III/50) are not subject to an amendment because the project will not alter cover in this management area. The amendment is a site-specific amendment and is applicable only to implementation of the decision for the Stonewall Vegetation Project.

Background

Elk serve as a management indicator for hunted species for the Helena National Forest (Forest Plan p. II/17). Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA) as well as the Forest Plan. The NFMA requires the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" [16 USC 1604(g) (3) (B)]. Forest Plan standards are in place to ensure that this requirement is satisfied.

The Forest Plan contains Forestwide big game standards and standards specific to each of the management areas identified in the Forest Plan. The standards that are the subject of this site-specific amendment are:

Forestwide Standard 3 *– Subject to hydrologic and other resource constraints, elk summer range will be maintained at 35 percent or greater hiding cover and areas of winter range will be maintained at 25 percent or greater thermal cover in drainages or elk herd units.*

Forestwide Standard 4 *– Implement an aggressive road management program to maintain or improve big game security.*

> *a. Road management will be implemented to at least maintain big game habitat capability and hunting opportunity. To provide for a first week bull elk harvest that does not exceed 40 percent of the total bull harvest, roads will be managed during the general big game hunting season to maintain open road densities with the following limits.*

The existing hiding cover to open road density ratio should be determined over a large geographic area, such as a timber sale analysis area, a third order drainage, or an elk herd unit.

Management Area T-2 Standards *– Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover on identified winter range.*

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested.

Management Area T-3 Standards *– Maintain a minimum of 35 percent hiding cover for big game.*

Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.

Description

The hiding cover analysis utilizes the Montana Fish, Wildlife, and Parks (MFWP) definition included in the Helena National Forest Plan (p. II/18): a stand of coniferous trees having a crown closure of greater than 40 percent. The 40 percent canopy cover metric is an acceptable ‘proxy’ for mapping hiding cover, as it is generally assumed that stands with 40 percent canopy cover or greater would in turn provide adequate vertical structure that would hide 90 percent of an elk at 200 feet, the functional definition of hiding cover. This relationship of canopy cover and stand structure is based on modeling done by Lonner and Cada (1982) and others (e.g. Leckenby et al. 1985, Thomas et al. 1988) who used canopy cover to predict the relationship between hiding cover (as estimated by canopy cover), road densities, and harvest rate the first week of the general hunting season.

The mountain pine beetle outbreak in the project area, including those herd units where the project occurs, has resulted in canopy cover losses in the lodgepole pine stands in the area. However, while these stands of trees remain upright they will continue to hide elk, despite losses in canopy cover. For this reason, the 2005 version of R1-VMap is assumed to accurately reflect current hiding cover despite the losses in canopy cover. This assumption has been validated by field data [see the Stonewall Elk Hiding Cover Synthesis/Management Area T2 and T3 Focus

Report in the project record] as well as other studies that have relied on pre-disturbance vegetation characteristics to predict post-disturbance wildlife habitat (e.g. Russell et al. 2007, Nappi and Drapeau 2011, Latif et al. 2013). Furthermore, Smith and Long (1987) observed a well-defined relationship between elk hiding cover and high densities of lodgepole pine boles, conditions found in the project area.

Regardless of project implementation, this loss of cover would occur naturally over the next few years due to extensive tree mortality and natural tree fall associated with the mountain pine beetle infestation (Mitchell and Preisler 1998, Lewis and Hartley 2005, among others). Dead trees within treatment areas comprised of lodgepole pine would continue to fall at which time these areas would no longer provide hiding cover. However, the removal of hiding and thermal cover may be more beneficial for elk in the long run in terms of quickening the regeneration rate of new forests in the Beaver Creek and Keep Cool Creek herd units.

Conclusion

The project may also result in short-term disturbance to elk. However, project design features would be included to minimize these disturbances. These measures include: restricting public use of temporary roads and restricting logging operations to a single drainage at a time, among others.

Further, this exemption should not preclude the Forest's ability to achieve the goals and objectives as outlined in the Forest Plan. The goal, to "maintain and improve the habitat over time to support big game and other wildlife species" (USDA 1986, p. II/1) is being achieved through the retention of hiding cover elsewhere throughout the project area. Our objective, -"management will emphasize…the maintenance or enhancement of elk habitat..." (USDA 1986, p. II/4) – is also being realized for the same reasons.

Project Design Features, Best Management Practices and Mitigation for the Action Alternatives

The Forest Service developed the following mitigation measures and project design features that apply to all of the action alternatives.

Table 9. Project design features, best management practices and mitigation

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
AIR-	**Air Quality Design Feature**	
AIR-1	Prescribed burning would be implemented in full compliance with the Montana Department of Environmental Quality (MDEQ) air program with coordination through the Montana/Idaho Airshed Group and reported to the Airshed Coordinator during active burning periods.	All alternatives, all burn units
AIR-2	Burning would be dependent upon site conditions and weather conditions. Notice of the pile and prescribed burning timeframes, or burn windows, would be shared with the public through paper notices and announcements on the Forest website.	All alternatives, all burn units
ARCH-	**Archaeology Quality Design Feature**	
ARCH-1	A Forest Service archaeologist will identify appropriate buffers (e.g., at least 100 feet) around known sites for avoidance. No mechanical thinning or log skidding within buffered boundaries. Directionally fell trees away from	All alternatives, affected units

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	sites. Do not pile or burn on sites. Cultural resources that occur within pile and burn units would be flagged and avoided. Hand control line as necessary to prevent burning over sites.	
ARCH-2	If the scope of work changes, or additional cultural resources are discovered during implementation of this project, work would stop in the area and a Forest Service archaeologist would be contacted. Work in the area would only resume if mitigation measures are determined or re-evaluated if necessary.	All alternatives, all units
ARCH-3	Mechanical equipment crossings need to be approved by Heritage staff prior to implementation. Ditch crossings need to be limited to as few as possible. Ditch crossing methods will need to be approved by Heritage Staff and will require consultation.	Lincoln Ditch
BOT-	**Botany Design Feature**	
BOT-1	If sensitive plant populations except whitebark pine (see SILV-2), are located within the project area, appropriate mitigation (e.g., site avoidance, avoid concentration of fuels on sites to be burned) would be followed upon consultation with a Forest Service botanist.	All alternatives, all units
FUEL-	**Fire Fuels Design Feature**	
FUEL-1	Prior to burning slash piles, logging areas may be open to public firewood gathering after the sale is closed, if wood is available. Other resource values, such as wildlife snags, down logs, and soils, would be protected. Notify the public of firewood opportunities after timber removal activities are completed.	Harvest units along existing open roads, all alternatives
FUEL-2	Prescribed burning control lines would be constructed as needed for holding actions or to protect resource area concerns.This includes black line, fireline, pruning, saw line and hose lays. Existing roads, trails, creek drainages, wet meadows, rocky outcrops and other natural barriers would be used as control lines where possible.	All alternatives, burn units
FUEL-3	Rehabilitate the appearance of fire lines and skid trails adjacent to or that intersect existing roads and trails to reduce the potential for unauthorized motorized use.	All alternatives, burn units
FUEL-4	Burning would take place under the guidelines set forth in a prescribed fire burn plan developed specifically for this project area. Prescribed burn plans address parameters for weather, air quality, and contingency resources.	All alternatives, burn units
FUEL-5	Hand piling and pile burning of natural and activity fuels may occur in portions of units adjacent to private land to reduce fuel loading levels prior to jackpot and underburning.	Alternative 2: Units 1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 47, 49, 51, 73; Alternative 3: Units 1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 47a, 47c, 51, 73
FUEL-6	Reduce fuel loading of coarse woody debris (greater than 3 inches diameter) to approximately 10 tons per acre, where possible.	Alternatives 2 and 3: Units 76, 88.
FUEL-7	Reduce fuel loading of coarse woody debris to 10-15 tons per acre	Alternatives 2 and 3: Unit 78.

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
FUEL-8	Slash understory fuels using chainsaws where needed to create burnable fuel bed.	Alternative 2: Units 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88; Alternative 3: Units 78, 80, 81, 82, 83, 84, 85, 86, 87, 88
NOX-	**Noxious Weed Design Feature**	
NOX-1	Incorporate all relevant guidance from FSM 2900 and the Environmental Protection Measures from the Helena National Forest Weed FEIS Record of Decision.	All alternatives, treatment units
NOX-2	Landings, skid trails or other activity areas (e.g., hand lines, control lines, burn piles) that have over 30 percent ground cover removal/soil surface disturbance, due to the activity, would be rehabilitated and seeded with a prescribed native seed mixture as soon as appropriate following the cessation of activities. Where slopes are under 15 percent, surfaces would be left rough to provide microtopography for seed and water catchment. Woody debris would be spread on the surface at a rate of 1 to 5 tons per acre in these areas to provide site stability as well as additional microsites. Where slopes are over 15 to 20 percent, surfaces would be left rough to provide microtopography for seed and water catchment. Woody debris would be spread on the surface at a rate of 5 to 10 tons per acre in these areas to provide site stability as well as additional microsites.	Timber harvest units Alternative 2: Units 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 18, 21, 29, 47, 49, 51, 73; Alternative 3: Units 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 18, 21, 29, 47a, 47c, 51, 73
NOX-3	Use Forest recommended certified native seed mixtures (weed-free seed)[3] where appropriate.	Alternatives 2 and 3 Units with underburning for restoration would not be seeded.
NOX-4	Where feasible for restoration of disturbed ground (e.g., hand lines, control lines, burn piles), cover bare soils with a thin layer of duff from adjacent sites, if available. It is important to leave some duff on adjacent sites where cover material is collected.	In units identified for pile burning throughout the project area: Alternative 2: Units 3, 4, 9, 14, 18, 21, 29; Alternative 3: Units: 3, 9, 14, 18, 21, 29 In addition, this applies to portions of the following units where pile burning is proposed along the Forest boundary: Alternative 2: Units 1, 2, 4, 5, 7, 8, 10, 11, 12, 47, 49, 51, 73; Alternative 3: Units 1, 2, 4, 5, 7, 8, 10, 11, 12, 47a, 47c, 51, 73
NOX-5	The portions of the haul route that require road work	Roads proposed for work, all

[3] Recommended certified weed-free seed mixtures are located in Appendix F of the Helena National Forest Plan.

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	(e.g., reconditioning, maintenance, construction) prior to haul should be treated with herbicides prior to the reconditioning early in the growing season to prevent seed set, and again in the fall following reconditioning to limit the effect of the ground disturbance.	alternatives
NOX-6	A 100-foot buffer around any sensitive plant species would be required when herbicides are applied. Within this buffer only hand pulling of weeds would be allowed[4].	All alternatives, treatment units
NOX-7	To the extent possible, considering other resource concerns, minimize the potential for spread of noxious weeds by conducting harvest activities under winter conditions. Specific mitigation for action alternatives describes additional benefits from frozen ground operations. Past studies have shown a substantial decrease in soil surface disturbance resulting from logging when the activity occurs on frozen ground (McIver and Starr 2000). Limited ground disturbance would result in lower risk of increased weed infestations.	All Alternatives, all units
NOX-8	Before moving into the project area, all equipment would be inspected and any mud, soil and plant parts would be removed. Cleaning must occur off National Forest System lands.This would not apply to service vehicles that stay on the roadway and travel frequently in and out of the project area.	All alternatives, treatment units
RNG-	**Range Design Feature**	
RNG-1	Protect existing livestock management fencing, or repair if damaged during operations.	All alternatives, where needed.
RNG-2	Fencing, temporary herding, or other techniques may be used to protect conifer regeneration where needed.	All alternatives, where needed.
RNG-3	Fence construction may be needed along allotment boundaries that would have natural barriers removed due to the project. This would primarily be of concern along the Stonewall allotment boundary on the west and east boundaries. Design all improvements for livestock management, such as fencing and water developments, in cooperation with a wildlife biologist.	All alternatives, where needed
REC-	**Recreation and Roadless Design Feature**	
REC-1	Minimize project activities during the first 2 weeks of the General Big Game Hunting rifle season.	All alternatives, treatment units
REC-2	No hauling on weekends and major holidays to minimize conflicts with the public users unless approved by the District Ranger.	All alternatives, treatment units
REC-3	Coordinate project implementation with recreation staff, Forest Public Affairs Officer and Law Enforcement to ensure the public is well informed of treatment schedules and potential impacts. Provide public notifications at of project activities (e.g., logging, hauling, prescribed burning) at major access roads, in local newspapers and	All alternatives, treatment units

[4] Environmental Protection Measure #22 from the Helena National Forest Noxious Weed FEIS and Record of Decision 2006

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	on the Forest webpage.	
REC-4	Work with local snowmobile groups and Forest Service biologist to identify alternative groomed snowmobile routes where winter operations are considered. Snowmobile trails are groomed from December 1 through April 1[5].	All alternatives
RDS-	**Roads Design Feature**	
RDS-1	Roads would be maintained in accordance with direction provided in FSH 7709.15 (Transportation System Maintenance Handbook) and would be at a level commensurate with the need for the following operational objectives; resource protection, road investment protection, user safety, user comfort, and travel efficiency.	Roads proposed for work
RDS-2	Remove danger trees, approximately one and one-half tree lengths from the roadway, as needed, along roads used for hauling and project implementation.	Roads proposed for work
RDS-3	Roads that would be built then obliterated immediately following timber removal and road reconstruction would be the minimum density, cost, and standard necessary for the intended need, user safety, and resource protection.	Roads proposed for work
RDS-4	Currently closed roads, and roads built then obliterated immediately following timber removal, would be closed (e.g., gates, barricades) during operations to limit use to administrative use only.	Roads proposed for work
RDS-5	Upon project completion, roads built then obliterated immediately following timber removal would be decommissioned and rehabilitated. Intersections with roads would be blocked by rocks, wood, or berms and would be slashed in and or ripped and covered with slash or seeded within site distance of open roads to reduce potential for use after the project harvest activities are completed.	Roads proposed for work
RDS-6	Provide warning and other signing in accordance with Forest Service signing standards, and restrict or temporarily close roads in active project areas to provide for public safety.	Roads proposed for work
RDS-7	A wetting agent (water or other dust-reduction material) would be applied as needed to decrease or eliminate dust generated from timber hauling on aggregate and native surface roads to provide for air quality and public safety.	Roads proposed for work.
RDS-8	Road design would be addressed in clauses in the contract package. At a minimum, the following items would be included in the design considerations: location, width, drainage, stream crossings, closures,	All alternatives, treatment units

[5]Alternative routes may be a groomed path along the side of a haul route that would be safe for snowmobiles, or allowing the user group to groom an approved "detour" type route along existing roads to provide trail connections or loop riding opportunities that may have otherwise been impacted by hauling activity.

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	decommissioning and rehabilitation.	
RDS-9	Existing open routes would be left in similar condition and drainage structures shall be left in functional condition.	Roads proposed for use, all alternatives.
RDS-10	For roads built then obliterated immediately following timber removal that cross a drainage, associated temporary structures and fills shall also be removed to the extent necessary to permit normal maximum flow of water and stream crossings restored to their original dimensions and contours.	Alternative 2 and 3: Road #5 between units 10 and 11
SILV	**Silviculture Design Feature**	
SILV-1 Aspen	Conifers suppressing aspen clones would be thinned from within and around suppressed aspen. Cut-tree diameter limits and cutting distance from aspen would be established and defined in stand and unit prescriptions.	Alternatives 2 and 3: Units 14,15,16,18,21,23,24,26, 28,3,30,31,32,33,4,44,45, 47,48,49,50,51,54,55,59, 6,61,62,63,64,65,66,67,68, 69,7,70,71,72,73,75, 46b,47b,47c,61a
SILV-2 Whitebark pine	Assess low- and mixed-severity prescribed burning units containing groups or stands of whitebark pine to determine if areas need pre-burn treatments to protect whitebark pine from damage during burning. If needed, pre-burn treatments should take place a year prior to the proposed landscape burning. The pre-burn treatments could include cutting and directional felling of conifer trees to increase fuel loadings, improve continuity of the fuelbed, and reduce fuel loads around whitebark pine trees. Created openings designed to serve as nutcracker caching sites should be cut as near-circular areas 1 to 5 acres around mature whitebark pine trees.	Alternatives 2 and 3: Units: 79,80,81,82,83,84,85,88
SILV-3	Where the opportunity exists in prescribed burning units where pre-burning tree cutting is proposed, thinned areas should be located around large ponderosa pine, Douglas-fir, western larch and aspen to protect the trees and to promote the regeneration of those species.	Alternatives 2 and 3: Units 76,77,78,79,80,81,82,83,84, 85,86,87,88, 80a
SILV-4	Merchantable dead trees would be removed except as needed to meet other resource criteria.	Alternatives 2 and 3: Units 4, 5, and all regeneration and commercial thinning units.
SILV-5 Whitebark pine	The Forest Service will conduct silvicultural reconnaissance of whitebark pine habitat post burn treatments to assess impacts and natural regeneration success. To the extent that funding and rust-resistant stock is available, the Forest Service will seek opportunities to plant whitebark pine in suitable habitat areas.	Alternative 2: Units 76,79,80, 81,82,83,84,85, 87, 88 Alternative 3: Units 79,80, 82,83,84, 85,87, 88
S/WS/F-	**Soils, Watershed and Fisheries Design Feature**	
S/WS/F-1	Maintain adequate soil cover following management treatments to reduce the risk of erosion. As a rough guideline, maintain at least 50 percent soil cover on slopes less than 35 percent, and more than 50% soil cover on steeper slopes. Soil cover includes vegetation, plant litter and duff, rocks (greater than 2 inches diameter), and woody material.	All alternatives, treatment units
S/WS/F-2	Conduct vegetation management activities using partial-	Skyline Units:

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	or full-suspension yarding methods (i.e., skyline cable yarding).	
S/WS/F-3	For vegetation management activities in forested ecosystems, retain 5 to 20 tons per acre of coarse woody material (greater than 3 inches diameter) for warm, dry types, and 10 to 20 tons per acre for other types following vegetation treatments[6]. The purpose of this BMP is to sustain long-term soil nutrient cycling.	5-20 tons per acre coarse woody material: Alternative 2 units: 2, 6, 7, 15, 16, 26, 30-33, 44, 50, 54, 55, 73, 75, 76, 78, 80, 81, 84-86; Alternative 3 units: 2, 6, 7, 15, 16, 30a, 31a, 32a, 44a, 50, 73, 75b, 78, 84, 85 (Balance of units 10-20 tons per acre coarse woody material)
S/WS/F-4	Re-use existing skid trails where practical. Before use, skid trail locations would be approved by Forest Service personnel.	All alternatives, treatment units
S/WS/F-5	Harvesting and skidding operations would be limited to time periods when dry soil conditions exist (summer operating period); or during "winter conditions" on lands outside of big game winter range to minimize detrimental soil effects in wet areas that are "sensitive" to rutting and compaction, and in areas where there is concern for soil cumulative effects. "Winter-conditions" are defined as, "…when there is at least 4 inches of frozen ground or 6 inches of packed snow" (USDA Forest Service 1988; BMP 13.06 and 14.04).	All alternatives, treatment units
S/WS/F-6	For prescribed fire management activities in the timber removal treatment areas, design burn prescriptions to burn when soil and duff moistures are high[7].	All alternatives
S/WS/F-7	Soil disturbance in units will be evaluated following harvest activities to determine if burning after harvest, as proposed, can be implemented and remain within Region 1 Soil Quality Standards. If it is determined that burning will exceed soil quality standards, then burn prescriptions will be adjusted so activities remain within standards. If burning prescriptions cannot be changed, then burning will be delayed until adequate soil recovery has occurred and soil quality standards are met.	Alternative 2 units: 4, 5, 9, 10, 11, 12, 13, 17, 19, 20, 21, 28, 29, 32, 40, 42, 43, 45, 46, 47, 49, 57 and 58 Alternative 3 units: 4, 5, 9, 10, 11, 12, 13, 28, 40, 42, 43, 46b, 47b, 47c, 57 and 58
S/WS/F-8	Skid trails would be designated with an average spacing of 100 feet.	All tractor treated units
S/WS/F-9	Following harvesting and skidding operations that result in the removal or displacement of litter, duff, soil, or coarse woody debris from the skid trail surface, the following activities would be conducted: · Litter, duff, soil, and woody debris displaced from the trail would be placed on the skid trail. · Slash and coarse woody debris that is placed on the skid trail would be compacted so that it is	All alternatives, treatment units

[6] Graham et al. 1994; Brown et al. 2003

[7] Proposed prescribed burns are designed to maintain some duff on the forest floor.

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	in contact with the soil surface. · Slash placed on skid trails would be placed over 65-70% of the skid trail surface , except within the viewshed at the approaches of routes that are open to motorized use a cover of 85-90% would be placed. Slash would be varied size classes of both fine and coarse woody debris.	
S/WS/F-10	Landings would be de-compacted and/or scarified as part of site preparation. Mulch and fine debris from on-site would be spread over the landing. Grass or trees would be seeded or planted on the disturbed site. Slash would be placed over 65-70% of the landing surface; except within the viewshed of routes open to motorized use a cover of 85-90% would be placed. Slash would be of varied size classes of both fine and coarse woody debris. Slash would be compacted so that it is in direct contract with the soil surface.	All alternatives, treatment units
S/WS/F-11	Where practicable, slash would be piled and burned in areas where detrimental soil disturbance already exists (i.e., abandoned log landings, skid trails, and roads associated with past activity). Handpiles would be constructed so they are no larger than approximately 6 feet in diameter and 4 feet high. Prior to hand piling, slash would be left through one winter after cutting to allow for initial decomposition and nutrient leaching. (Exception: units adjacent to private land or those identified in the silviculture prescription with insect concerns may be piled and burned as soon as possible to reduce fire hazard.)	All alternatives, treatment units
S/WS/F-12	Where practical, burn pile footprints would be covered with on-site mulch, fine debris, and slash. Burn pile footprints would be seeded or planted with the appropriate grass or tree species.	All alternatives, treatment units
S/WS/F-13	In skyline corridors, place on-site mulch, fine debris and slash. Also seed or plant with the appropriate grass or tree species.	Units requiring restoration: Alternative 2: Units 15, 53; Alternative 3: Units 15, 53
S/WS/F-14	Precommercial thin (PCT) units would be hand thinned.	Alternative 2 2, 3, 14, 16, 18, 21, 48-51, 59-61, 64-73, 75-88 Alternative 3 2, 3 14, 16, 17a, 19a, 20a, 29a, 30a, 31a, 32a, 44a, 45a, 46a, 47a, 48, 50, 51, 59, 61a, 66-73, 75b, 78, 79, 80a, 82-85, 87, 88
S/WS/F -15	Installation, removal or replacement of culverts would be restricted to periods when stream channels are dry; or would be avoided from May 1 to August 1 to reduce the risk of affecting cutthroat trout eggs in stream gravels.	As needed
S/WS/F -16 RHCAs	INFISH (USDA 1995) Riparian Habitat Conservation Areas (RHCAs) would be marked in the locations where dead tree removal is to occur between the road and the stream. A clear means of identifying trees that are to be	See Figure 15, RHCA map with INFISH buffers

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	cut and removed, cut and left in place, or left standing would need to be recognized. As provided for with INFISH (USDA 1995) standard RA-2, dead trees cut that are not needed for woody debris recruitment or floodplain needs, can be removed. Green commercial trees within the RHCA that have not been attacked by beetles and are not otherwise at risk of dying in the immediate future would remain. Avoid locating log landings in RHCAs.	
S/WS/F -17 RHCAs	Additional areas requiring INFISH buffers are likely to be found during vegetation unit layout that are not currently identified on project area maps. These areas would be identified during implementation and the appropriate buffers and mitigations applied to them to meet INFISH (USDA 1995) and Helena Forest Plan standards. **RHCA boundaries** -**Category 1--**Fish bearing streams have a RHCA width of 300 feet either side of the stream or the 100-year floodplain whichever is greater. **-Category 2**--For perennial streams not supporting fish, the RHCA is 150 feet either side of the stream. **-Category 3**-- For lakes and wetlands greater than one acre, the RHCA is a minimum of 150 feet but can be larger and extend to the outer limits of riparian vegetation, the extent of seasonally saturated soil, the extent of highly unstable areas, or the distance equal to the height of one site-potential tree. **-Category 4**--For Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides and landslide prone areas, the RHCA boundary is one-half site potential tree from the edges of the stream channel, wetland, landslide, or landslide prone area, or a 50-foot slope distance, whichever is greatest. **The following documents the specific treatment of trees within INFISH Categories 1-4 RHCAs associated with streams.** *Situations where dead or insect infested trees may be removed while still meeting INFISH standard RA-2.* If the tree is between the creek and the road, within a tree length of the road, leaning toward the road or standing straight, and is not within a tree length of the creek and does not fall into what is considered a wider floodplain category (the situation where side channel development is possible) then the tree may be felled and removed If the tree is between the creek and the road, within a tree length of the road, not within a tree length of the creek, is on a bench elevated above the floodplain, and is standing either straight or leaning toward the road the tree can be removed. Salvage trees within the RHCA can be removed in the situation where the road is between the creek and the tree, as these trees are not potential contributors to large woody debris or stream channel form and function. The exception would be when the road is immediately adjacent to the stream. In this situation, the tree can be	See Figure 15, RHCA map with INFISH buffers

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	removed if the portion of the tree bole exceeding four inches would not span the stream should the tree fall toward the creek. For the separate situation where the road parallels a stream and then crosses a tributary to the stream, the salvage trees on the uphill side of the road, including those within a tree length of the tributary, can be cut and removed unless leaning directly toward the tributary. Precommercial thinning of green trees is allowed with hand treatment. Prescribed burning is allowed as long as it meets state SMZ rules.	
S/WS/F -18 Stream Management Zones	The State of Montana Stream Management Zone (SMZ) Law (2007) prohibits broadcast burning in SMZs (see Rule 3 (26.6.603), specific to prescribed burning). During broadcast or underburning, no ignition would take place in an SMZ; however, some fire may back into the SMZ.	SMZ portions of units
S/WS/F-19	Follow standard Forest Service timber contract road Best Management Practices. Cross-drain culverts on existing roads to be used for hauling in the project area would be brought up to standard for functionality. Follow all applicable road and harvest BMPs listed in the FS Soil and Water Conservation Practices Handbook (USDA 2010)	All alternatives, treatment units
S/WS/F-20	Avoid hauling and other heavy-equipment traffic during conditions where the road surface is at or near saturation.	All alternatives, treatment units
S/WS/F-21	Avoid snowplowing on any road adjacent to a stream as much as possible. At stream crossings, avoid sidecasting of snow into the stream. Leave drainage points in the snow berm to avoid concentration of snowmelt on the road surface.	Identify specific sections of road
S/WS/F-22	Avoid use of heavy equipment in any wetland identified during unit layout.	All alternatives, treatment units
S/WS/F-23	Minimize cleaning of vegetated roadside ditches that are providing adequate road drainage.	All alternatives, treatment units
S/WS/F-24	Areas cleared of vegetation such as landings or roadside drainage ditches would be seeded with an approved native seed mix.	All alternatives, treatment units
S/WS/F-25	Erosion control and drainage improvement BMPs would be used to reduce sediment at stream crossings. Sediment filtering devices (e.g., filter fence and weed-free straw bales) would be used as needed to limit erosion and delivery of disturbed material into streams or ephemeral drainages.	All alternatives, treatment units
S/WS/F-26	Sediment sites 607-E-01 on Stonewall Creek and 626-B1-01 on a tributary to Lincoln Creek would have sediment-filtering devices installed combined with gravel surfacing to reduce erosion.	Alternatives 2 and 3
VIS-	**Visual Design Feature**	
VIS-1 Intermediate and Regeneration	Along roadways boundaries and private property, vary unit sizes, widths, shapes and distance from the center line. Consider leaving single trees and/or groups of trees to	Alternative 2: Units 1, 10, 13, 17, 20, 39, 40, 41, 46 Alternative 3: Units 1, 10, 13, 17a, 20a, 39, 40, 41, 46a, 46b

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
Harvest and Precommercial Thinning	visually connect with the unit's edges. Utilize natural breaks in topography and vegetation type to delineate treatment edges. Feather the edges to avoid a shadowing or edge effect in the cut unit. Where the unit is adjacent to denser forest including private land, the percent of thinning within the transition zone would be progressively reduced toward the outside edge of the unit. In addition, vary the width of the transition zone. Where the unit interfaces with an opening, the percent of thinning within the transition zone would be progressively increased toward the outside edge of the unit. In addition, vary the width of the transition zone. Soften edges by thinning along unit boundaries, and removing larger trees and favoring smaller ones, where applicable. This would reduce a vertical wall or edge effect.	
VIS-2 Road, Skid Trail, and Landing Construction	Where feasible, locate and orient roads to minimize cut and fill. Cut and fill banks would be sloped to accommodate natural revegetation. Cut and fill slopes would be revegetated with native species where ever possible.	All alternatives, all roads built then obliterated
VIS-3 Road, Skid Trail, and Landing Construction	Side cast topsoil during the construction of roads built then obliterated immediately following timber removal, to use topsoil for obliteration and rehabilitation.	All alternatives, all roads built then obliterated
VIS-4 Road, Skid Trail, and Landing Construction	Where roads built then obliterated immediately following timber removal and skid trails meet a primary travel route, they should intersect at a right angle and, where feasible, curve after the junction to minimize the length of route seen from the primary travel route.	Alternative 2: Units 13 and 46 Alternative 3: Units 13, 46a, 46b
VIS-5 Road, Skid Trail, and Landing Construction	Where feasible, retain screening trees one tree-height below roads and landings (including cable landings) when viewed from below. Avoid creating a straight edge of trees by saving clumps of trees and single trees with varied spacing.	All alternatives, all roads built then obliterated, all landings
VIS-6 Road, Skid Trail, and Landing Construction	When viewed from above, retain, screening trees one tree-height above roads and landings and/or prescribe a higher leave basal area. Avoid creating a straight edge of trees by saving clumps of trees and single trees with varied spacing.	All alternatives, all roads built then obliterated, all landings
VIS-7 Road, Skid Trail, and Landing Construction	Log landings, roads, and bladed skid trails should be minimized within sensitive view sheds.	Alternative 2: Units 1, 13, and 46 Alternative 3: Units 1, 13, 46a, 46b
VIS-8 Slash Treatment	In sensitive foreground areas, stumps should be cut to 8 inches or less in height, where possible. Spread soil on cut stumps to reduce color contrast where cut stumps are visible in sensitive foreground areas.	Alternative 2: Units 2, 13, 46, 73, 76, 77, 79, 80, 81, 82, 83, 84, 85, 87, 88 Alternative 3: Units 2, 13, 46a, 46b, 73, 79, 80, 82, 83, 84,

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
		85, 87, 88
VIS-9 Slash Treatment	Burn piles would be completely burned, or residual burnt material would be scattered within sensitive viewsheds.	Alternative 2: Units 1, 13, and 46 Alternative 3: Units 1, 13, 46a, 46b
VIS-10 Unit Marking	Use cut tree (as opposed to leave tree) marking or species designation, as determined by a landscape architect and presale forester to minimize marking in visually sensitive areas.	Alternative 2: Units 1, 13, 16, 17, 46 Alternative 3: Units 1, 13, 16, 17a, 46a, 46b
VIS-11 Unit Marking	Unit boundaries would be marked with water-based paint.	Alternative 2: Units 1, 13, 16,17, 46 Alternative 3: Units 1, 13, 16, 17a, 46a, 46b
VIS-12 Prescribed Fire	See FUEL-2	Alternative 2: Unit 46 Alternative 3: Units 46a, 46b
VIS-13 Tree Planting	Tree planting should be completed in an irregular pattern with clumping to mimic future islands similarly found in the characteristic landscape.	Planting units
WL-	**Wildlife Design Feature**	
WL-1 Roads	To retain habitat for snag-dependent species and species dependent on large diameter trees, the location of roads to be built then obliterated immediately following timber removal would ensure, whenever practical, that veteran and relic survivor trees and snags would not be removed during construction.	Alternative 2: Roads 3-9, Alternative 3: Roads 5, 7 and 8
WL-2 Roads	To maintain habitat for snag-dependent species, the timber sale contract or contract administrator would ensure, whenever practical, that the design of skid trails and cable corridors avoid veteran and relic trees and snags.	To be determined during implementation
WL-3 Roads	Existing roads that are currently closed or restricted and utilized for this project would be retained in their pre-project road status.	Roads all alternatives
WL-4 Roads	Roads built then obliterated immediately following timber removal will be closed (e.g., gates, barricades) throughout project implementation to limit use to administrative use only.	Alternative 2: Roads 3-9, Alternative 3: Roads 5, 7 and 8
WL-5 Snags	Retain a minimum of 2, 12- to 20-inch d.b.h. snags per acre. If snags are not available, retain recruitment trees. Preferred species for retention include larch, ponderosa pine, Douglas fir, spruce and sub-alpine fir, in that order. No lodgepole snags would be retained to meet Forest Plan direction.	Harvest units
WL-6 Snags	In harvest and precommercial thinning units, retain snags greater than 20 inches diameter of any species unless they pose a specific safety or operability concern	Harvest and precommercial thinning units
WL-7 Snags	In prescribed burn units retain snags greater than 12 inches diameter unless they pose a safety hazard	Prescribed burn units without harvest or precommercial thinning treatments
WL-8 Snags	Whitebark pine snags would be retained unless they pose a safety or operability concern	Harvest and prescribed burn units

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
WL-9 Downed Woody Debris	Forest Plan wildlife downed woody debris objectives would be met through retention guidelines under S/WS/F-3. The following measures would be implemented to ensure larger diameter material is left on site: · Where they are present on site, maintain at least 4 down logs per acre at least 12 inches diameter (at large end) and 20 feet long. · During burning, avoid the consumption of large coarse woody debris (e.g., logs greater than 10 inches diameter at midpoint) to the extent possible.	All alternatives, treatment units.
WL-10 Vegetative Diversity	Where feasible and when consistent with fuel reduction objectives, use control lines and firing techniques to maintain pockets of understory vegetation and shrubs retained during timber harvest and small pockets of understory vegetation at scattered locations in un-harvested burn units.	All alternatives burn units
WL-11 Vegetative Diversity	Units would be evaluated following burning to determine if protective measures (e.g., fencing or grazing modifications) are necessary to allow vegetation recovery and promote aspen. This should be coordinated with the wildlife biologist if necessary.	All alternatives burn units
WL-12 Aspen	Promote and protect existing aspen as needed during implementation.	All alternatives, treatment units
WL-13 Elk	If elk calving (late May through mid-June) or nursery areas (late June through July) are identified prior to or during project implementation,management activities would be delayed duing active periods.	All alternatives, treatment units
WL-14 Elk	To minimize impacts to elk, logging operations will be limited to one drainage at a time, designed to provide undisturbed areas within the drainage, and work would be completed in the shortest time frame possible.	All alternatives, treatment units.
WL-15 Elk	If an elk wallow is identified during layout, treatment would be modified if necessary to ensure that adequate cover is retained adjacent to the wallow.	All alternatives, treatment units.
WL-18 Elk	Recreational use of firearms would be prohibited for anyone working within an area closed to the general public.	All alternatives, treatment units.
WL-19 Elk	Slash depth would not exceed 1.5 feet across regeneration harvest units.	All alternatives, regeneration harvest units.
WL-20 MIS	If nest sites for MIS are discovered during the layout or implementation of the project, the wildlife biologist would be notified to determine appropriate protection measures.	All alternatives, treatment units
WL-21 Goshawk	Maintain a 40-acre no-activity buffer around known goshawk nests. Within the Stonewall East nest territory (Sucker Creek drainage), no openings created by mixed severity burning will occur between the 40-acre no-activity buffer and within a 180-acre radius of the nest.	Alternatives 2 and 3: Units 43 and 72. Alternative 2: Unit 80, Alternative 3: Unit 80a
WL-22 Goshawk	Within active goshawk territories restrict ground disturbing activities inside Post-fledgling Areas (420 acres) between April 15th and August 15th. This will be	Alternatives 2 and 3: Units 43 and 72. Alternative 2: Unit 80, Alternative 3: Unit 80a

Design Feature	Stonewall Vegetation Project Design Feature	Applicable Unit/Alternative
	coordinated with a wildlife biologist and buffer distances will be expanded if field data indicates that it is necessary.	
WL-23 Raptors	If raptor nests are identified during project implementation, a wildlife biologist would be contacted and appropriate buffers and Limiting Operating Periods established.	All alternatives, treatment units
WL-25 TES	If any threatened, endangered or sensitive species are located during project layout or implementation, a wildlife biologist would be notified. Management activities would be altered, if necessary, so that protection measures can be taken.	All alternatives, treatment units
WL-26 Lynx and Elk	Cutting of brush along low speed (closed) roads will be done to the minimum amount necessary for safety.	Roads to be identified during implementation
WL-27 Lynx	Within burn units outside the 2-mile zone of the WUI, a pre-treatment field review, coordinated by a wildlife biologist, would identify firing patterns and control lines necessary to ensure that inclusions of stand initiation and multi-story hare habitat are not affected.	Alternative 2: Units 81-84, 88; Alternative 3: Units 82-84, 88.
WL-28 Lynx	To promote or maintain lynx habitat characteristics while reducing fuels and promoting aspen/ponderosa pine, treatment would be designed and laid out in coordination with a wildlife biologist.	Alternative 2: Units 40-43, 46, 47 and 75: Alternative 3: Units: 40-43, 46a, 46b, 46c, 47a, 47b, 47c and 75.
WL-29 Bald Eagle	Project prescribed burn plans would consider the Beaver Creek eagle nest as sensitive and ensure that smoke is adequately dispersed away from the nest during the nesting season (January 1 through July 15th).	All Alternatives, burn units
WL-30 Bald Eagle	Aircraft associated with proposed burning shall not be permitted within 1,000 ft. of the Beaver Creek nest between January 1 and August 31.	All Alternatives, burn units
WL-31 Migratory Birds	Prescribed burns and underburning would be implemented prior to May 15 or after July to protect nesting birds.	All alternatives, underburning units
WL-32 Grass/forb and Shrub Communities	To maintain a shrub component, and where feasible and consistent with fuel reduction objectives, use control lines and firing techniques to maintain 30 to 50 percent of existing shrubs in a patchy mosaic.	Alternatives 2 and 3: Unit 88
WL-34 Old Growth	Stands classified as old growth would be burned with a low-intensity fire to minimize mortality to trees greater than 19 inches d.b.h.	Alternative 2: Unit 81

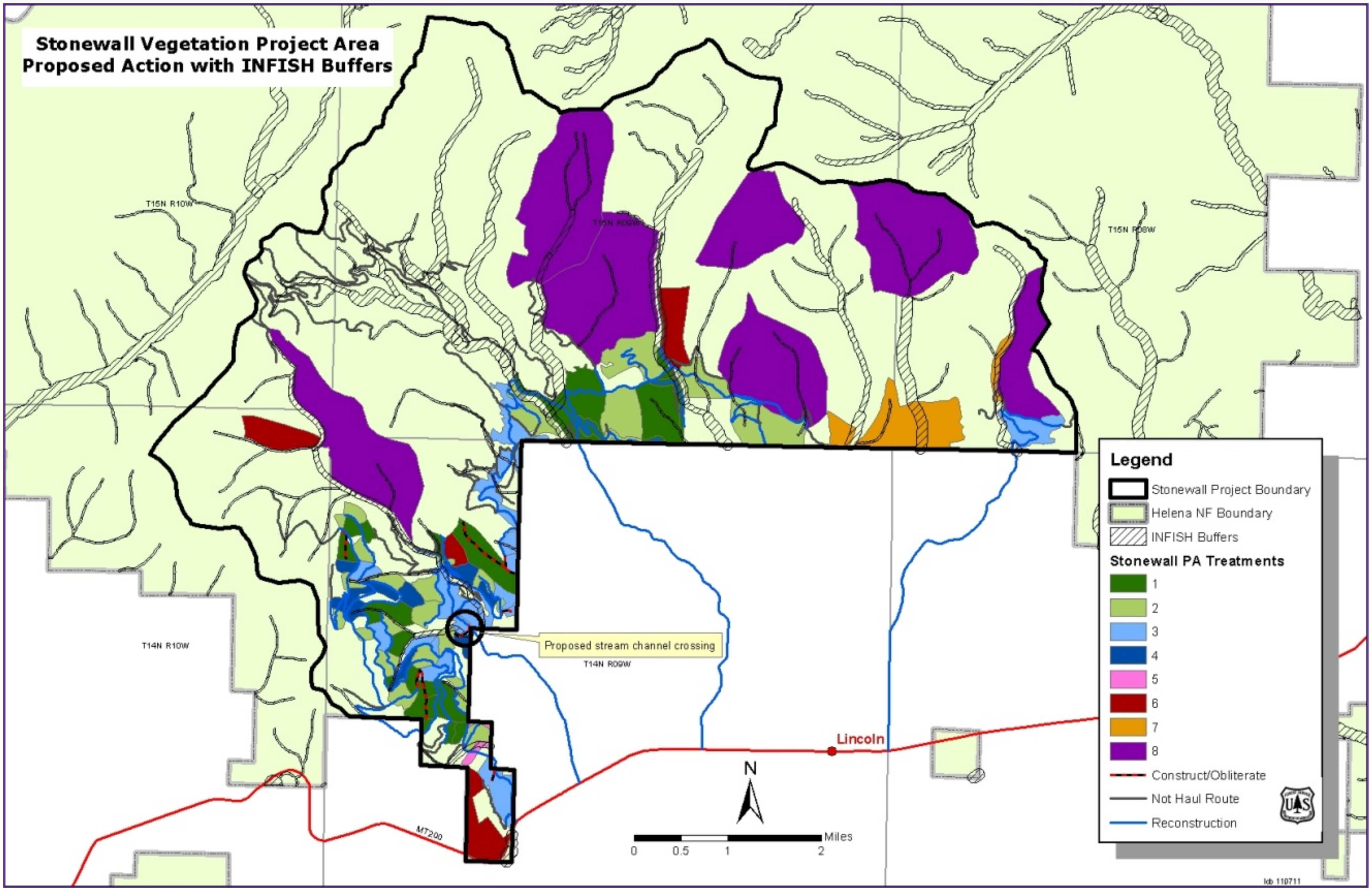

Figure 15. Proposed Action treatments with INFISH buffers

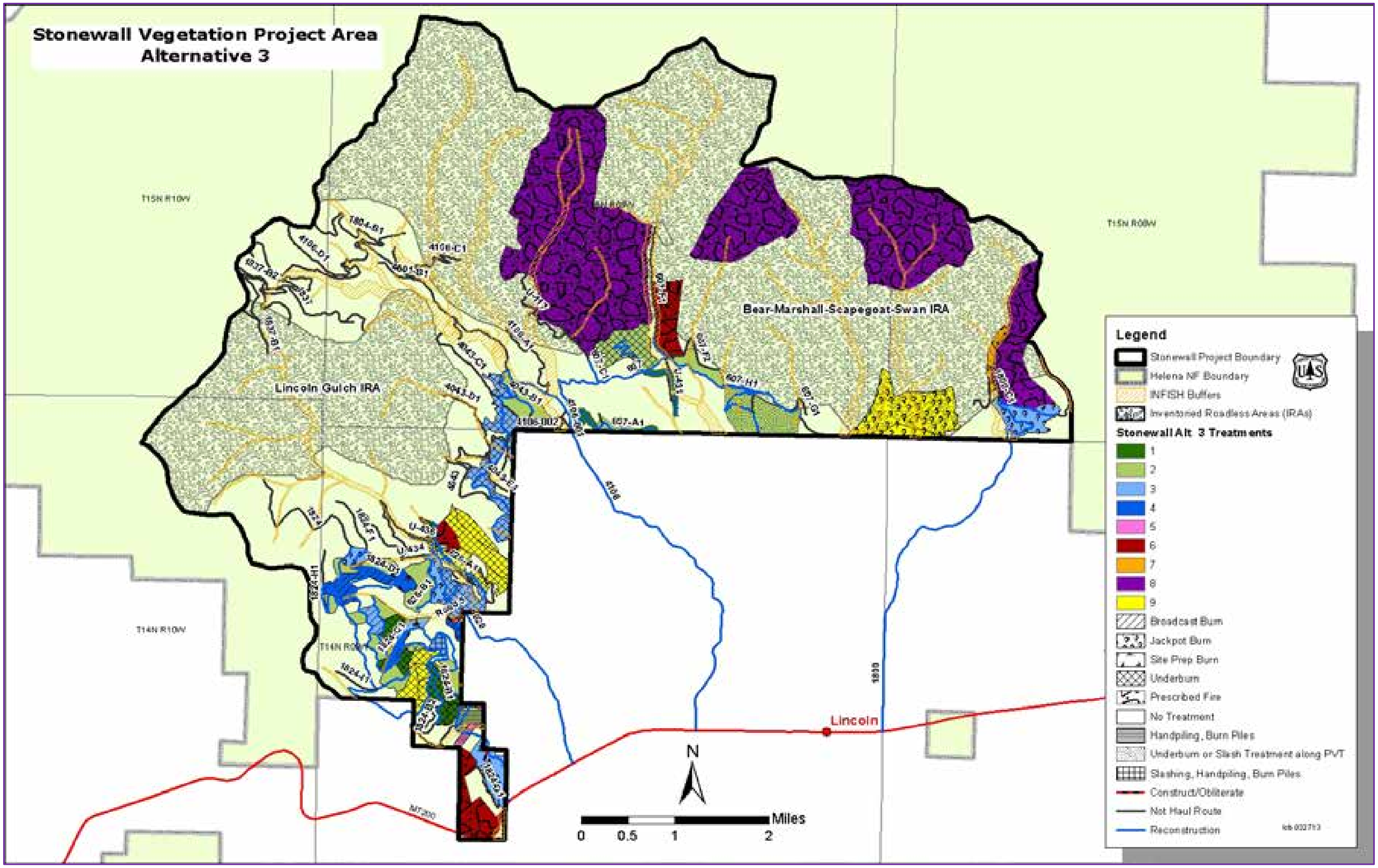

Figure 16. Alternative 3 treatments with INFISH buffers

Monitoring

Noxious weed monitoring would consist of visually surveying all units that were previously infested. Areas that were not previously infested would be monitored for weeds by visually surveying the units in year one and year three following the disturbance and/or rehabilitation. If weed populations are found, those areas would be treated according to label guidelines and within the guidance provided in the HNF Weed Treatment Project FEIS (2006).

If additional sensitive plant populations are found during implementation, those populations would be monitored to insure mitigation measures are effective.

All landings, skid trails or other areas of disturbance due to the logging activities that have over 10 percent soil surface disturbance would be monitored for weed infestations each spring for three seasons following implementation. If any of the species on the Montana Noxious Weed list or County lists are located within the disturbed areas, the infestations would be treated using appropriate herbicides for three seasons following the harvest activity.

If it is determined that illegal off-highway vehicle (OHV) use is taking place in areas where treatments have occurred, steps should be taken to prohibit the use (i.e. signing, barrier installation, increased law enforcement).

Monitor National Forest System trail conditions following prescribed burning to determine if there is a need for increased trail maintenance for specific areas due to fallen trees or increased erosion.

Monitoring cultureal resources is recommended after signing of the ROD, as well as during and after project implementation, to ensure that the mitigation measures are implemented. The following monitoring plan is recommended:

- Conduct a field check on all cultural resources identified within treatment units to make sure they are visibly flagged for avoidance before implementation.
- Random site visits should occur during project implementation to ensure protection measure are being followed.
- Conduct site visits to all cultural resources within treatment units after implementation, but before the contract is closed, to ensure known cultural resources where not damaged.
- Close coordination between HNF heritage specialist, timber sale administrator, and fuel specialist will need to be done to ensure protection of cultural resources.

If any additional cultural resources are discovered during implementation of this project, work should cease in the area and a Forest archaeologist would be contacted. Work in the area could only resume if mitigation measures can be determined and/or re-evaluated if necessary.

A meeting between HNF Heritage Specialist, the Timber Administrator and the Contractor (once awarded) should be done to stress the importance of protecting known cultural resources within the treatment units.

For a units scheduled for burning, close coordination between HNF Heritage and Fuel Specialist will need to be done to ensure protection of cultural resources. The monitoring above applies to burn unites as well.

It is recommended that mechanical harvest activity should avoid the exclusionary zone of the Old Lincoln Townsite. An archaeologist should monitor harvesting activities onsite at the Lincoln Ditch (and its various segments in the APE) and the historic Kosta Cabin site. A Forest Service archaeologist should be given 1 weeks' notice to be on site before harvest or burning activities occur.

Roadless area monitoring would consist of visually surveying units treated with prescribed fire to determine if illegal off-highway vehicle use is taking place in treated areas. If monitoring reveals this is happening, steps would be taken to eliminate the use (i.e. signing, barrier installation, increased law enforcement).

The following road management monitoring recommendations are suggested for road facilities:

- Complete the annual roads accomplishment report (RAR).
- Roads within the project area should be surveyed as needed to comply with Forest Service-assigned road condition, survey requirements for deferred maintenance needs and real property inventory.

Best management practices (BMPs) evaluations should be performed periodically by the sale administrator. Best management practices evaluations should focus on effectiveness and on whether BMPs were applied.

The Southwestern Crown Collaborative (SWCC), one of the original 10 Collaborative Forest Landscape Restoration Projects (CFLR) selected for funding, has agreed to allocate 10 percent of the CFLR funds received to monitoring. The SWCC is in the process of developing a Long-term Monitoring Plan, which is still in draft. The role of the SWCC monitoring is to determine the effects of forest restoration efforts with the goal of validating or improving restoration methods to achieve restoration objectives. Goals for ecological, social, and economic monitoring for the SWCC were articulated both within the Forest Landscape Restoration Act (FLRA) and the SWCC proposal. Five major goal areas for monitoring over the 10-year life of the project are: fire and fuel dynamics; biodiversity of plants and animals; soil and water; economic impacts; and social implications.

Some of these monitoring efforts would likely occur in the Stonewall project; however, details of the SWCC's specific monitoring plans in the Stonewall area have not been finalized.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need and were provided in the DEIS. (See DEIS appendix A, table A-2 for specific comments pertaining to alternatives, by letter (L) and comment number (c) (denoted by L#, c#).) Some of these alternatives may have been outside the scope of restoration, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

Maximize timber harvest and fuels reduction activities, particularly in the Wildland Urban Interface. (L1, c2)

The wildland urban interface (WUI) was identified during development of the Tri-County Regional Community Wildfire Protection Plan (2005). The proposed action was designed to address fuels concerns on National Forest System lands adjacent to private lands. Treatments on private lands are outside the scope of our proposed action, but past, current and planned treatments are considered in the individual specialist's cumulative effects reports, where applicable.

We reviewed the project area to identify potential vegetative treatments based on site conditions.

This alternative would be similar to the proposed action, and is analyzed in detail.

The roadless areas within the project area were created by the Rare 2 process identifying possible additions to the wilderness system. Management should reflect this quality. In addition, burning whitebark pine seedling and sapling areas, present in the roadless areas, could reduce white bark pine habitat, an important food source for grizzly bears. Consider an alternative that does not include prescribed burning in the roadless areas, but allows for the use of natural prescribed fire without mechanical treatments, including cutting trees and brush, in the roadless areas. (L5 c7; L48 c8)

The large prescribed burn units in the roadless areas are proposed to improve the mix of vegetation composition and structure across the landscape making it more diverse, resilient, and sustainable to wildfire and insects. In particular, the burns in the roadless areas would be designed to encourage whitebark pine regeneration in proximity to existing mature whitebark pine trees. Portions of some units are lacking adequate ground fuels to carry fire across the desired burn unit locations. Without the prep work, burn prescriptions could not be implemented and fire lines could not be prepared.

For any action alternative, design feature SILV-2 is incorporated to protect whitebark pine from damage during burning by assessing low- and mixed-severity prescribed burning units containing groups or stands of whitebark pine to determine if areas need pre-burn treatments. Future regeneration efforts include creating openings around mature whitebark pine trees to serve as nutcracker caching sites. In addition, the Forest Service would also seek opportunities to plant whitebark pine in suitable habitat areas (SILV-5).

The no-action alternative does not include slash treatments or prescribed burning in the roadless area but would address this issue. Implementing no management in these areas would allow the continuing trend regarding the reduction of whitebark pine and aspen.

This alternative would not address the purpose and need to improve the mix of vegetation composition and structure, or modify fire behavior to create conditions that allow the reestablishment of fire as a natural process across the roadless area portions of the landscape. This alternative was eliminated from detailed analysis.

Burning activities proposed may char merchantable timber and decrease its value in areas managed for timber products. Consider an alternative that does not include prescribed burning in areas managed for timber products. Prescribed fire units in management areas T1-5 include all of units 2 and 78, and portions of units 77, 79, 80, 81, 84, 85, 86 and 87. (L79, c2, c3)

The Forest Plan identifies prescribed burning as an appropriate tool for vegetation and fuels management (pages II/33 - 34), and the Forest Fire Management Plan direction in place at the time of implementation would be followed. The no-action alternative does not include controlled burning in areas managed for timber products.

This alternative would not address the purpose and need to modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Therefore, this alternative was eliminated from detailed analysis.

Proposed actions may disturb landscapes allowing existing weed populations to expand or allowing additional species to become established. Consider an alternative that eliminates units that have noxious weeds present on roads within units from fire management proposals. (L5 c2)

The Forest Weeds FEIS (USDA Forest Service 2006) identified most of the roads in the project area for weed monitoring and treatment due to the presence of weeds. Appropriate preventive measures incorporated in the project design features include post treatment spraying of landings within the first year after mechanical treatment, and monitoring in the third and fifth years with retreatment if needed.

The no action alternative addresses this suggestion and is analyzed.

Eliminating units with noxious weeds would eliminate fire management treatments in all units in the WUI accessed by existing roads. Not treating areas within the WUI would not enhance community protection. This alternative would not meet the purpose and need for the project of modifying fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape.

Eliminating the units within the WUI would not meet the purpose and need for the project of modifying fire behavior to enhance community protection. In addition, the appropriate project design and mitigation of relevant best management practices are incorporated in the action alternatives. Therefore, developing an alternative that eliminates units that have noxious weeds present on the roads within them from fire management proposals is not necessary. This alternative was eliminated from detailed analysis.

Public comments noted the continued loss of motorized recreational opportunities as a primary concern. A recommendation was made to consider a Pro-Recreation Alternative that would address recreation opportunities and include the following characteristics (L26 c1, 2, 4):

- Dispersed camping within 300 feet of all existing routes
- Use of seasonal closures, where required, to protect the environment and wildlife with the intention of keeping routes open for the summer recreation season
- All of the existing routes are needed as OHV routes due to the cumulative effects of all other closures
- Additional OHV routes are needed to address the growing popularity of OHV recreation and the greater needs of the public for access and motorized recreation

Effects to recreation resources would be addressed in analysis and project design features would be included to minimize potential impacts to recreation opportunities within the project area.

Travel management is being evaluated in the current Blackfoot Travel Plan (Non-Winter) and the appropriate project design and mitigation of the relevant best management practices would be applied to any developed action alternative. Developing a Pro-recreation alternative with additional OHV routes was considered, but this would not address the purpose and need identified for this project for fuels reduction in the WUI or restoration across the landscape. Therefore, this alternative was eliminated from detailed analysis.

Consider a watershed or ecosystem restoration alternative or incorporate restoration elements in the alternatives considered. (L53 c6, 10, 11)

The Stone Dry Watershed Assessment (2009) was considered when developing the proposed action. The purpose and need includes a restoration element. The proposed action was designed to incorporate treatments that move the project area towards a more resilient forest to address restoration of vegetative composition and structural diversity elements. Effects to vegetation and watershed resources would be discussed in Chapter 3 of the EIS.

Watershed restoration and reducing sedimentation is often focused on changes to roads, and includes fixing drainage structures, road design or decommissioning roads. Changes to existing road alignments and decommissioning existing roads are being evaluated in the current analysis for the Blackfoot Non-Winter Travel Management Plan and therefore not being considered in this proposal. Roads built for the Stonewall Vegetation Project would be obliterated immediately after timber removal.

Since many of the watershed elements of concern are being evaluated in the current Blackfoot Non-Winter Travel Plan, and the appropriate project design and mitigation of relevant best management practices would be applied to any developed action alternative, a true or purer watershed restoration type alternative is not necessary; therefore, this type of alternative was not considered in detail.

Comparison of Alternative Effects

This section provides a summary of the effects of implementing each alternative. The following section displays a summary of effects to biophysical settings, species habitats and analysis issues in the Stonewall Vegetation Project area by alternative.

Vegetation

Vegetative conditions within the project area are described in chapter 1 and chapter 3. Proposed treatments address the purpose and need of the project. Following is a summary of the vegetative effects

Purpose and Need: Enhance and Restore Aspen, western larch, and ponderosa pine species and habitats

Whether a treatment would result in an increase in a particular tree species depends upon the type of treatment, the characteristics of the tree species, and the current presence of the tree species in the area receiving the treatment. Treatments vary widely in the opportunity they provide to manipulate the presence of a particular species. Intermediate treatments provide a great deal of control through tree selection preferences applied during thinning if the tree species is present and regeneration treatments provide a great deal of control through control of seed sources and planting of preferred species. Prescribe burns provide opportunities to increase fire-tolerant or shade-intolerant early seral species such as ponderosa pine, western larch, and quaking aspen through killing competing fire-intolerant species and through creating open areas for regeneration although the degree of control is not great simply due to the variable nature of prescribed burning.

The effects of the three alternatives upon within-stand tree species compositions by treatment group and as a proportion of the landscape are displayed in chapter 3 **(**Table 29**. Alternative comparison for ponderosa pine, western larch, whitebark pine, and aspen)**.

Alternative 1 would continue the current condition in which the four species have declined in presence within stands and upon the landscape due to succession and the recent mountain pine beetle epidemic. In the long term, those four species would continue to decline as succession continues. Alternatives 2 and 3 would result in an increase in the presence of all four species, with alternative 2 leading to the greatest increase due to the greater treatment area involved, and the greater area in regeneration and intermediate treatments which have the greatest potential for modifying species composition at the stand level.

Purpose and Need: Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects

The expected effects of the three alternatives on within-stand species compositions are displayed in chapter 3 (Table 30**. Alternative comparison for stand structures)**.

Under alternative 1, the current condition would persist, and the general track of tree species on the landscape would be toward increases in Douglas-fir, subalpine fir, and Engelmann spruce and decreases in the early seral species—ponderosa pine, quaking aspen, western larch, whitebark pine, and lodgepole pine. Lodgepole pine would regenerate in many areas in which it was a major component before the mountain pine beetle epidemic, becoming a component in mixed-species stands with Douglas-fir, Engelmann spruce, and subalpine fir. Treatments in both alternatives 2 and 3 would modify the current condition and increase ponderosa pine, western larch, quaking aspen, and whitebark pine as discussed above. Both alternatives would improve the mix of tree species in treated areas, resulting in tree species mixtures that would be more diverse and resilient. Alternative 2 would result in greater effects than Alternative 3 due to the greater acreage treated, and the greater acreage treated with intermediate and regeneration treatments.

The effects of the three alternatives on stand structures in terms of tree diameter distributions for proposed treatment type groups are displayed in chapter 3 **(**Table 30**. Alternative comparison for stand structures)**.

Alternative 1 would continue the current condition in the short term and long term; stand understories would become denser and the stands more closed. Stand diameter distributions would remain the same in the short term and in the long term would tend to become more steeply weighted toward smaller diameters due to ingrowth and natural mortality of the larger diameter classes. Treatments in both alternatives 2 and 3 would modify the track that the stands are on with the degree and nature of the effects depending upon the type of treatment. Intermediate harvests (Groups 1 and 10) would "flatten" the diameter distributions by thinning small and mid-sized trees while retaining the largest trees—creating open multi-story structures. Precommercial thinning (Group 2) would create open, single-story stands by pre-commercially thinning even-aged, closed, single-story plantations. Regeneration treatments (Groups 3 and 4) would create even-aged stands with a small number of older and larger trees present as seed sources, shelter, or retention trees. Removing dead and dying trees and slashing undesirable understory trees (Group 5) would create stands that are open and almost single-story. Low-intensity prescribed burns (Groups 6 and 9) would flatten the diameter distributions due to killing many of the smaller diameter trees and would create stands that are more open and still multi-story. Mixed-severity prescribed burns (Groups 7 and 8) would create areas that are mosaics of structures including open and closed single-story, open and closed multi-story, and early-seral grass/forb/shrub openings. The effects of all treatments would last into the long term but eventually the stands would become more closed and multi-story as trees grow and as the stand understories fill in.

The effects of the three alternatives on stand structures at the landscape level by comparing the proportion of change within Biophysical Setting/vegetation fuel class combinations are displayed in chapter 3 (Table 31**. Alternative comparison for landscape-level stand structures).**

Under alternative 1 in the short term the current condition would persist, which in general is below desired in (1) early seral and mid-seral open for all Biophysical Settings, (2) mid-seral closed in the two subalpine fir Biophysical Settings, and (3) in late-seral open for the two Douglas-fir and the ponderosa pine-Douglas-fir Biophysical Settings. Vegetation-fuel classes are above desired in all other combinations. Long-term trends under alternative 1 would be: decreasing early-seral, mid-seral closed, mid-seral open, and late-seral open in almost all Biophysical Settings due to tree growth and filling in of stand understories. Both alternative 2 and alternative 3 would: (1) increase area in early-seral for all BpS, (2) decrease area in mid-seral closed for all BpS, (3) increase area in mid-seral open for all but upper subalpine BpS, (4) increase area in late-seral open for all BpS, and (5) decrease area in late-seral closed in all Bps. Alternative 2 would bring about greater change than alternative 3 due largely to the greater acreage treated. Both alternatives 2 and 3 would move the vegetation-fuel classes toward the reference condition, but largely due to the small portion of the analysis area proposed for treatment there would still be relatively great differences between present and reference condition for many BpS/vegetation-fuel class combinations.

Purpose and Need: Forest health in terms of reduced susceptibility (increased resistance) of individual stands and the landscape to diseases and insects found within the project area of concern

In chapter 3, **(**Table 32. **Alternative comparison for insects and diseases**) we compare the three alternatives in terms of susceptibility to several insects and diseases that are impacting stands in the project area

Under alternative 1, in the short term there would be little change from the current condition, which in general is (1) low and long-term decreasing risk for those insects and diseases dependent upon early seral trees such as the pines (e.g., mountain pine beetle), (2) higher and long-term increasing risk and impacts from those dependent upon Douglas-fir, subalpine fir, and Engelmann spruce, and (3) relatively low but long-term increase in susceptibility to armillaria which affects all conifers but for which pines and western larch are more resistant than the other conifers. Both alternatives 2 and 3 would generally reduce susceptibility to insects and diseases in treated stands and on the landscape. Exceptions to this would be white pine blister rust, for which we cannot say that the treatments would directly reduce the disease and Douglas-fir beetle for which the prescribed burning may increase risk in the treated areas to a small degree and short period of time. Over the landscape, both alternatives would increase resistance to insects and diseases by increasing tree species diversity and age class diversity, reducing stocking and so increasing individual tree resistance, and modifying structures. Alternative 2 would reduce susceptibility to a greater degree than alternative 3, largely because a greater area is being treated.

Transportation

Under the no-action alternative, no changes would be made to the existing transportation network on and adjacent to the project area. There would be no changes to effects or impacts on the project transportation network.

Alternatives 2 and 3 would use approximately 48.2 and 44.3 miles, respectively, of roads to access vegetation treatment units and connect with Montana State Highway 200. Existing roads would serve as project access and haul routes on nearly 45.6 miles under alternative 2 and 44.3 miles under alternative 3. Under alternative 2 another 2.6 miles of new roads would be constructed to access treatment units. Under alternative 3 approximately 0.4 mile of road would be built then obliterated immediately following timber removal. These roads would be closed (e.g., gates, barricades) during operations to limit use to operators only, and obliterated or rehabilitated immediately following vegetation treatments.

Cumulative effects of past, present, and foreseeable actions are expected to have minor impacts on the project transportation network. Project haul routes would be maintained and improved in accordance with BMPs to accommodate haul vehicles. Sediment sites would be mitigated to reduce long-term sediment delivery. Annual road maintenance activities would also occur on National Forest System roads and also on adjacent State and private roads.

Fire and Fuels

The mechanical treatments proposed would reduce surface fuels, raise canopy base heights by reducing ladder fuels and stand density, resulting in modified fire behavior potential. The result would be safer, more efficient and direct initial attack of unwanted fires by fire suppression forces.

The prescribed burn treatments would reduce fuels and break up contiguous vegetation to create a heterogeneous fuelscape so that areas with high fire behavior potential are interspersed with areas of mixed and low fire behavior potential, thereby limiting the potential for high-intensity crown fire to spread towards the WUI. Fire management has evolved over time and fire managers look for opportunities to manage fire for multiple objectives. Reintroducing fire to the landscape and allowing it to occur as a natural process is desired in order to move the landscape toward the desired condition as outlined in the LRMP.

The Stonewall Vegetation Project would be important to the success of future fire suppression efforts and complements past treatments and those currently occurring or being proposed on adjacent federal, state and private lands.

The following analysis issues or concerns were identified for this project during the scoping period. The alternatives will address the issues as follows.

1. Wildland Fire and Homes: Proposed treatments may be inefficient and ineffective in reducing home losses due to fire.

Proposed treatments would reduce surface, ladder and crown fuels and change the fuel model profile, thereby decreasing the area with potential for flame lengths greater than four feet and reducing potential crown fire risk. In addition, alternative 2 or 3 would reduce the risk of wildfire impacts to adjacent private lands and other resource values. By treating these areas, they become more resilient to stand-replacing wildfire and allow greater protection within the WUI zone.

2. Fire Behavior: Proposed fuels reduction work will not reduce fire behavior.

Fire modeling suggests the proposed treatments would effectively reduce fire behavior. Following implementation of a chosen alternative, the treated areas should exhibit surface fire under the modeled conditions, making fire suppression efforts safer and more effective. With these alternatives, desired fuel loadings and fire behavior characteristics would be achieved and natural or prescribed fire could occur with less risk.

3. Prescribed Burning: Concerns over risk of fire escaping burn boundaries during prescribed burning operations.

All prescribed burning would occur when weather and fuel conditions are favorable. All burning would take place under the guidelines in the prescribed fire burn plan developed specifically for project-related burning activities. Prescribed burn plans address parameters for weather, air quality, contingency resources and potential escapes.

Air Quality

Wildfires are known to result in high levels of emissions and associated national ambient air quality standards (NAAQS) violation and worst visibility. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems. According to (Wiedinmyer and Hurteau 2010) wide-scale prescribed fire application can reduce CO2 fire emissions for the western US by 18 to 25 percent. The total amount of pollutants released by prescribed burning under alternative 2 and 3 would be spread out over several years and would occur when emissions would be unlikely to have significant adverse effects on human health and visibility. After implementation, it is estimated that subsequent wildfires in the project area could produce less pollutants due to less fuel available to burn.

All prescribed burning would be implemented in full compliance with Montana Department of Environmental Quality (MDEQ) air program with coordination through the Montana/Idaho Airshed Group. All action alternatives would meet Forest Plan Standards for air quality by following coordination requirements. The project complies with the Federal Clean Air Act.

Habitats of Special Concern

Snags

The forested landscape would experience additional bark beetle mortality from the ongoing mountain pine beetle (MPB) epidemic. The levels of additional mortality are a matter of speculation, but available research indicates that mountain pine beetle epidemics continue until the available bark beetle habitat is sufficiently reduced that epidemic levels can no longer be sustained (Cole and Amman 1969, Cole and Amman 1980, Klein et al. 1978, Mitchell and Preisler 1991). Mountain pine beetles strongly favor infesting the trees of larger diameter each year and over the life of the infestation infesting smaller trees each year until the average host tree diameter declines to a point that the tree habitat cannot produce sufficient numbers of beetles to maintain the outbreak (Cole and Amman 1969, Cole and Amman 1980). The outbreaks are relatively short, lasting about 6 years (Cole and Amman 1969, Cole and Amman 1980). Given the magnitude of the mortality that has occurred in the project area as of the writing of this report, we suspect that the epidemic is declining.

The lodgepole pine snags would start falling in three to five years after death (Bull 1983, Mitchell and Preisler 1998). Snag fall rates depend on tree species, tree size, cause of death, and environmental conditions that could affect the speed of bole decay (Bull 1983, Mitchell and Preisler 1998). For lodgepole pine, Bull (1983) found that 8 years after death about 75 percent of the snags less than 25 cm had fallen and 42 percent of the snags greater than 25 cm had fallen. Mitchell and Preisler (1998) in their study of mountain pine beetle-killed snags in Oregon found that tree size was not a factor in unthinned stands and that in unthinned stands, 50 percent were down in 9 years and 90 percent were down in 14 years.

In the short term, snag numbers would be very high, but in the long term, snag numbers would decline greatly as the lodgepole pine snags fall down.

As discussed and displayed above, given the recent mountain pine beetle epidemic, snags in the project area are abundant and far exceed forest plan requirements. Under alternative 2, the intermediate and regeneration treatments would reduce snag levels to the forest plan requirements within the treatment units and the mixed-severity prescribed burns would increase snag levels within the burn units. After the treatments are done, snag levels would slightly decrease in the 3rd-order drainage 0203, slightly increase in the 3rd-order drainage 0204A, and slightly increase in the project area. They would still exceed 19 times the forest plan requirements. Under alternative 3, the intermediate and regeneration treatments would reduce snag levels to the forest plan requirements and the prescribed burns would increase snag levels. After the treatments are done, snag levels would slightly decrease in the 3rd-order drainage 0203, slightly increase in the 3rd-order drainage 0204A, and slightly increase in the project area. They would still exceed 20 times the forest plan requirements.

Old Growth

Effects to designated old growth in the two 3rd-order drainage are the same under all alternatives because no activities are proposed in designated old growth in these drainages. Following the process described above, about five percent of each 3rd-order drainage is designated to manage as old growth. All old growth would continue to develop successionally under all alternatives. Changes would be slight in the short term, but could be substantial in the long term. Single-story and two-story stands would become more multi-story. Closed canopies would remain closed, and open stands would become closed over time. Down woody fuels would continue to accumulate.

About 63 percent of the designated old growth is Douglas-fir type. With continuing succession, more small trees would become established with the species composition trending toward subalpine fir (Fischer and Clayton 1983). These stands are susceptible to Douglas-fir beetle (DFB), western spruce budworm (WSB), and root disease. ADS data appears to indicate that DFB has consistently declined in recent years, while WSB infestation was extensive in 2009, substantially less was recorded in 2010 (Amell and Higgins 2015). Douglas-fir beetle tends to infest large and old Douglas-fir and heavily stocked stands. Their impacts can also be affected by weather conditions, for example droughts that reduce host tree vigor. With increasing stocking, tree size and age over time, we can expect DFB to continue to impact the stands to some degree, increasing with the next droughty period. Since forests in the area, including the old growth stands, are progressing toward dominance by Douglas-fir and subalpine fir, we can expect the impacts of WSB to continue if not increase. Diseases would continue to impact stands at current levels.

In the long term, dense forest conditions with multiple-layer stands and increasing surface fuels would support increasingly intense fire behavior and severe fire effects (Buhl 2015). Stand replacement fire would become more likely on the landscape and old-growth stands more susceptible to the impacts.

No designated old growth in 3rd-order drainages would be treated under any alternative. Forest Plan direction regarding old growth would be met. Under alternative 2 outside of the 3rd-order drainages, three stands (42201139, 42201147, and 42201152) that may potentially be old growth would be prescribed burned; one stand that has been verified by a recent stand exam (41502089) would be prescribed burned, and one stand that has been verified by a recent stand exam (42303103) would be thinned and prescribed burned. Under alternative 3 outside of the 3rd-order drainages, one stand that has been verified by a recent stand exam (41502089) would be prescribe burned, and one stand that has been verified by a recent stand exam (42303103) would be partially thinned and the fuels burned. Stands proposed for treatment would be changed by the treatments, with species compositions “pushed” toward dominance by seral fire-tolerant conifers, and stand structures “pushed” to or toward open, but still multi-story, structures with relatively flat diameter distributions. Treated potential and verified old-growth stands would still qualify as old growth following the treatments.

Wildlife

Overview of Issues

The following issues were identified as a result of public scoping and used to develop alternatives to the proposed action. Also, these issues as well as other issue indicators identified to measure potential impacts to wildlife from alternatives considered in the project environmental impact statement are displayed in the following table. Effect indicators are collectively used to assess species viability or population changes.

- Restoration of vegetation communities
- Grizzly bear habitat impacts
- Elk security cover and the LRMP standard.
- Lynx habitat: Designated Critical Habitat and Stand Initiation Phase acreage
- Wildfire hazard, risk, and fuels
- Habitats including ponderosa pine, western larch and aspen: maintenance or restoration
- Road impacts to elk and grizzly bear habitat as well as disturbance factors

Species	Indicator
Threatened and Endangered Species	
Grizzly Bear	Effects to individuals and changes in security cover and potential conflicts with humans. Security Core habitat, Open Road Density (ORD) and Total Road Density (TRD) are specific measures used to evaluate changes within the recovery area, whereas changes in cover and forage within and outside the NCDE are assessed.
Canada Lynx	Effects to individuals and acres of stand initiation, multi-story and mid-seral habitat affected in Lynx Analysis Units (LAU’s bl-7 and bl-8). Compliance with the Northern Rocky Mountain Lynx Management Direction (NRLMD 2007b) standards and guidelines.
Wolverine	Effects to individuals and acres of natal denning and foraging habitat. Availability of remote and dispersal habitat and changes in connectivity and human access.

Species	Indicator
Sensitive and Federal Candidate Species	
Gray Wolf	Effects to individuals and changes in big game. Den, rendezvous and foraging habitat affected.
Fisher	Effects to individuals and acres of den, rest and foraging habitat. Changes in human access.
Townsend's Big-eared Bat	Effects to individuals and acres of and effect to foraging habitat.
Bald Eagle	Effects to individuals, suitable nest habitat affected, effects to reproduction and nest and foraging habitat availability.
Black-backed Woodpecker	Effects to individuals, acres of suitable habitat, changes in quality and distribution of suitable snag habitat.
Flammulated Owl	Effects to individuals and acres of suitable habitat. Short and long-term changes in the quality of suitable open-canopy habitat, availability of large diameter (>=19 inches) snags.
Western Toad	Effects to individuals, acres of breeding and upland habitat affected.
Management Indicator Species	
Northern Goshawk	Effects to individuals and reproduction. Acres of nest and foraging habitat, nest, foraging and post-fledgling habitat affected, landscape level changes in habitat. Ability of the project area to support nesting pairs.
Pileated Woodpecker	Effects to individuals and reproduction. Acres of old growth habitat, existing and affected suitable habitat, changes in quality of foraging and nesting habitat, large snag (>=20 inches d.b.h.) availability and changes in project area distribution and use.
Hairy Woodpecker	Effects to individuals and reproduction, acres of suitable habitat, acres of suitable habitat affected, changes in quality of suitable habitat, snag (all size classes) availability. Changes in project area distribution and use
American Marten	Effects to individuals and reproduction. Existing and affected suitable habitat. Changes in the quality of den and foraging habitat, project area distribution and use, and snag and downed woody debris (DWD) availability.
Commonly Hunted Species	
Elk	Acres of hiding and thermal cover, habitat effectiveness, acres of security habitat, changes in access and mortality, acres of foraging habitat, and compliance with the Montana logging study. Changes in hunting opportunity.
Mule Deer	Acres of hiding and thermal cover, acres of foraging habitat, changes in project area distribution and use and hunting opportunities.
Migratory Species	
Migratory Birds	Changes (acres) in available habitat (Biophysical settings), compliance with MBTA.

Effects Determinations

The following table displays effects determinations for wildlife by alternative

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Threatened and Endangered Species			
Grizzly Bear	The risk of stand-replacing wildfire remains high, but no direct effects are anticipated and in the absence of wildfire, grizzly habitat would be largely unchanged. Because whitebark pine would likely continue to decline, implementation of alternative 1 **may affect but is not likely to adversely affect** grizzly bear.	Improve landscape-level foraging habitat, maintain whitebark pine, result in short- and long-term reductions in cover and increase the risk of bear/human interaction. Overall project implementation is not anticipated to adversely affect grizzly bears. However, due to the current degraded baseline of the Red Mountain subunit it is the determination of the analysis that short-term road use within the subunit for implementation of alternative 2 **may affect, likely to adversely affect** grizzly bear.	Improve landscape- level foraging habitat, maintain whitebark pine, result in short- and long-term reductions in cover and increase the risk of bear/human interaction. Overall project implementation is not anticipated to adversely affect grizzly bears. However, due to the current degraded baseline of the Red Mountain subunit it is the determination of the analysis that short-term road use within the subunit for implementation of alternative 3 **may affect, likely to adversely affect** grizzly bear.
Canada Lynx	The risk of wildfire remains high, however, because there are no direct effects and considering winter foraging and den habitat remains largely unchanged, implementation of alternative 1 **may affect, not likely to adversely affect** Canada lynx.	All treatments fall within the WUI, meet exceptions for VEG S5 and VEG S6, and comply with VEG G10. Treatments comply with VEG S1 and VEG S2, and fuel treatment projects that do not meet VEG S1, VEG S2, VEG S5 and VEG S6 occur on less than 6 percent of the available habitat on the Helena Forest. Proposed treatments comply with Northern Rockies Lynx Management Direction (USDA Forest Service 2007b), and there are no effects anticipated that were not considered in the BO (USDI Fish and Wildlife Service 2007b). As a result implementation of alternative 2 **may affect, likely to adversely affect** Canada lynx.	All treatments fall within the WUI, meet exceptions for VEG S5 and VEG S6, and comply with VEG G10. Treatments comply with VEG S1 and VEG S2, and fuel treatment projects that do not meet VEG S1, VEG S2, VEG S5 and VEG S6 occur on less than 6 percent of the available habitat on the Helena Forest. Proposed treatments comply with Northern Rockies Lynx Management Direction (USDA Forest Service 2007b), and there are no effects anticipated that were not considered in the BO (USDI Fish and Wildlife Service 2007b). As a result implementation of alternative 3 **may affect, likely to adversely affect** Canada lynx.

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Canada Lynx Critical Habitat	**No effect.**	All treatments are consistent with the NRLMD (USDA Forest Service 2007b). While some treatments within winter foraging habitat would occur within the WUI, treatments were designed considering standards to promote lynx conservation and collectively application of the standards for vegetation management are expected to avoid adverse effects to lynx (USDI Fish and Wildlife Service 2007b p. 43). **May affect, likely to adversely affect Critical Habitat**	All treatments are consistent with the NRLMD (USDA Forest Service 2007b). While some treatments within winter foraging habitat would occur within the WUI, treatments were designed considering standards to promote lynx conservation and collectively application of the standards for vegetation management are expected to avoid adverse effects to lynx (USDI Fish and Wildlife Service 2007b p. 43). **May affect, likely to adversely affect Critical Habitat**
Sensitive and Federal Candidate Species			
Wolverine	Although recent fires have reduced wolverine foraging and den habitat, suitable habitat would continue to be available. While the risk of future wildlife is greatest under this alternative, there is no way to predict if or when wildfire would occur. As a result and based on the above analysis and the following rationale, implementation of alternative 1 would **no impact** upon wolverine.	The Stonewall project was analyzed for effects to wolverines based on vegetation changes, movements across the landscape, and the distribution from human activities associated with the project. Based on the analysis provided and the following rationale, it is determined that implementation of the Stonewall Veg Management Project **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**	The Stonewall project was analyzed for effects to wolverines based on vegetation changes, movements across the landscape, and the distribution from human activities associated with the project. Based on the analysis provided and the following rationale, it is determined that implementation of the Stonewall Vegetation Management Project **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**
Gray Wolf	Suitable wolf habitat, including remote areas for denning and big game populations would remain largely unchanged. As a result, and considering that human use and access is not expected to increase, implementation of alternative 1 would have **no impact** on wolves.	No known den or rendezvous sites would be affected. Disturbance to foraging wolves during implementation could occur, but would involve short-term disturbance during implementation. Big game populations and wolf foraging opportunities would be maintained in the short term and	No known den or rendezvous sites would be affected. Disturbance to foraging wolves during implementation could occur, but would involve short-term disturbance during implementation. Big game populations and wolf foraging opportunities would be maintained in the short term and increased in the long

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
		increased in the long term. The likelihood of stand-replacing wildfire is lowest under this alternative. Alternative 2 has the potential for short-term impacts to foraging or dispersing wolves. However, based on the analysis and the above rationale, implementation of alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**	term. The likelihood of stand-replacing wildfire would be reduced across the landscape, but at a reduced level from that of alternative 2. Alternative 3 has the potential for short-term impacts to foraging or dispersing wolves. However, based on the analysis and the above rationale, implementation of alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**
Fisher	Suitable habitat would be largely maintained. Risk of stand-replacing wildfire is greatest under this alternative. Because there are no direct effects anticipated and considering suitable fisher habitat would remain relatively unchanged, implementation of alternative 1 would have **no impact** on fisher.	Approximately 88 percent of the existing suitable habitat would be maintained. Preferred riparian habitat and travel corridors as well as prey availability would be maintained and the risk of stand-replacing wildfire is lowest under this alternative. The action alternatives would reduce fisher habitat by 11 to 12 percent and alter the structural conditions on approximately 38 percent of the existing fisher habitat. Based on the above analysis and the following rationale, implementation of alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**	Approximately 91 percent of the existing suitable habitat would be maintained. Preferred riparian habitat and travel corridors as well as prey availability would be maintained and the risk of stand-replacing wildfire would be reduced under this alternative when compared to no action. The action alternatives would reduce fisher habitat by 9 to 10 percent and alter the structural conditions on approximately 24 to 25 percent of the existing fisher habitat. Based on the above analysis and the following rationale, implementation of alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**
Townsend's Big-eared Bat	**No impact.** Hibernacula, swarming and roost habitat would not be affected and foraging	The action alternatives would affect suitable habitat on 35 percent of the project area. Based on the above	The action alternatives would affect suitable habitat on 27 percent of the project area. Based on the above

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	habitat would be largely unchanged. The risk of stand-replacing wildfire is highest under this alternative.	analysis and the following rationale, implementation of alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Hibernacula, swarming and roost habitat would not be affected A total of 8,562 acres of suitable foraging habitat would be affected by treatment. No mortality is anticipated although short-term disturbance from smoke to foraging bats could occur. Available foraging habitat would be widespread and the risk of stand-replacing wildfire is lowest under this alternative.	analysis and the following rationale, implementation of alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Hibernacula, swarming and roost habitat would not be affected. A total of 6,562 acres of suitable foraging habitat would be affected by treatment. No mortality is anticipated although short-term disturbance from smoke to foraging bats could occur. Available foraging habitat would be widespread and the risk of stand-replacing wildfire is reduced under this alternative.
Bald Eagle	**No impact.** No anticipated impacts to the existing eagle nest, although the risk of wildfire is highest under this alternative.	Existing habitat in the project area habitat would be largely unaffected. As a result alternative 2 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** No direct effects to nesting birds or reproduction anticipated. Approximately 100 acres of potentially suitable nest habitat would be reduced. Foraging habitat would not be treated, although short-term disturbance to foraging birds could occur. Untreated nest and foraging habitat would continue to be widely available. Risks of wildfire are lowest under this alternative.	Existing habitat in the project area habitat would be largely unaffected. As a result alternative 3 **May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** No direct effects to nesting birds or reproduction anticipated. Approximately 100 acres of potentially suitable nest habitat would be reduced. Foraging habitat would not be treated, although short-term disturbance to foraging birds could occur. Untreated nest and foraging habitat would continue to be widely available. Risks of wildfire would be reduced when compared to no action.
Black-backed Woodpecker	**No impact.** Suitable BBW habitat would continue to	**May Impact Individuals or habitat, but will not likely**	**May Impact Individuals or habitat, but will not likely contribute to a**

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	be widely available across the Forest.	**contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable BBW habitat would continue to be widely available across the Forest.	**trend towards federal listing or loss of viability to the population or species.** Suitable BBW habitat would continue to be widely available across the Forest.
Flammulated Owl	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable flammulated owl habitat would continue to decline under this alternative. While large diameter nest trees would increase in the short term, availability would decline over the long term. The likelihood of high intensity wildfire is greatest under this alternative.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Owl habitat would be restored or created on almost 4,200 acres or 31 percent of the dry forest community. Treatments would promote ponderosa pine and potential nest trees across the landscape and the likelihood of stand-replacing wildfire is lowest under this alternative.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Owl habitat would be restored or created on almost 2,800 acres or 21 percent of the dry forest community. Treatments would promote ponderosa pine and potential nest trees across the landscape and reduce the likelihood of stand-replacing wildfire when compared to no action.
Western Toad	**No impact.** Western boreal toads and their habitat would not be affected. The risk of stand-replacing wildfire and a long-term reduction in breeding and upland habitat is highest under this alternative.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable habitat would continue to occur on sites treated and long-term foraging habitat would be improved. The likelihood of impacts to breeding and upland habitat from high severity wildfire is lowest under this alternative.	**May Impact Individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.** Suitable habitat would continue to occur on sites treated and long-term foraging habitat would be improved. The likelihood of impacts to breeding and upland habitat from high severity wildfire would be reduced when compared to no action.
Management Indicator Species			
Northern Goshawk	**Not likely to cause a local or regional change in habitat quality or population status**. Suitable nest habitat would increase,	**Not likely to cause a local or regional change in habitat quality or population status.** Suitable nest, forage and PFA habitat	**Not likely to cause a local or regional change in habitat quality or population status.** Suitable nest, forage and PFA habitat

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	although landscape diversity associated with foraging and post-fledging habitat would be largely unchanged. Risk of stand-replacing wildfire and a reduction in suitable nest habitat is highest under this alternative.	would occur in all affected drainages and landscape conditions resulting from treatment are consistent with goshawk use. The risk of stand-replacing wildfire and a reduction in suitable habitat is lowest under this alternative.	would occur in all affected drainages and landscape conditions resulting from treatment are consistent with goshawk use. The risk of stand-replacing wildfire and a reduction in suitable habitat would be reduced.
Pileated Woodpecker and Hairy Woodpecker	**Not likely to cause a local or regional change in habitat quality or population status** for the pileated or hairy woodpeckers. Suitable snags and nesting and foraging habitat would be maintained and continue to be widely available.	**Not likely to cause a local or regional change in habitat quality or population status** for the pileated or hairy woodpeckers. A long-term reduction in habitat would occur on 540 acres, whereas the quality of suitable habitat would be reduced for 10 to 20 years on 2,666 acres. Over the long term, restoration of open grown ponderosa pine and western larch may improve habitat on 5,700 acres and the risk of stand-replacing wildfire Is lowest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status** for the pileated or hairy woodpeckers. A long-term reduction in habitat would occur on 200 acres, whereas the quality of suitable habitat would be reduced for 10 to 20 years on 1,920 acres. Over the long term, restoration of open grown ponderosa pine and western larch may improve habitat on 4,500 acres and the risk of stand-replacing wildfire Is reduced under this alternative.
American Marten	**Not likely to cause a local or regional change in habitat quality or population status.** Existing habitat would be maintained. The risk of stand-replacing wildfire is highest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status.** Treatments would improve species and landscape diversity, and maintain 93 percent of the suitable habitat over the long term. Also the risk of stand-replacing wildfire is lowest under this alternative.	**Not likely to cause a local or regional change in habitat quality or population status**. Treatments would improve species and landscape diversity, and maintain 96 percent of the suitable habitat over the long term. The risk of stand-replacing wildfire is reduced under this alternative.
Commonly Hunted Species			
Elk	In the Beaver Creek unit hiding cover would continue to be available to meet the 50 percent level of Forest Plan standard 3. Due to the effects of the 2003 Snow Talon fire, the Keep Cool unit is below and would continue to be below the 50 percent level of Forest	Treatments proposed under alternative 2 would reduce elk hiding and thermal cover in both herd units, whereas the amount and distribution of forage would increase. **Neither herd unit would meet Forest Plan standard 3 or 4a. This alternative would require a site-**	Treatments proposed under alternative 3 would reduce elk hiding and thermal cover in both herd units, whereas the amount and distribution of forage would increase. **Neither herd unit would meet Forest Plan standard 3 or 4a. This alternative would require a site-**

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Plan standard 3. With continued MPB mortality, hiding and thermal cover within both units would continue to decline. While forage availability may increase in some areas, due to continued fire suppression and overstocked stand conditions, overall forage availability would continue to be low. Due to the reduced cover conditions, **neither herd unit meets Forest Plan standard 4a for big game security.** Cover would continue to decline, however, it is expected that available habitat would continue to support desired levels of elk. Finally, due to increased fuel loading, the risk of a long-term loss of cover from stand-replacing wildfire is greatest under this alternative. Herd numbers would be largely unchanged. Effects of predation would be largely unchanged. The risk of a long-term reduction in cover from wildfire is highest under this alternative.	**specific, non-significant forest plan amendment for standards 3 and 4(a) for the reductions in elk hiding cover and thermal cover, as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3.** Hunting opportunities would be maintained and based on the analysis presented above and the following rationale, adequate elk habitat would continue to be available within both units to support desired levels of elk. · Implementation would result in both short- and long-term increases in available forage on approximately eleven percent of the combined herd units, including increases on summer, transition and winter range. The increase in forage is expected to maintain or improve herd health. · There would be no increase in public access or changes to elk security habitat. · Within the combined herd units approximately 89 percent of the existing hiding cover and 86 percent of the existing thermal cover would be maintained. Cover would continue to be available within and adjacent to treatment units and across the landscape. · Past wildfires have greatly reduced project area elk habitat and much of the remaining habitat is at risk. Implementation of alternative 2	**specific, non-significant forest plan amendment for standards 3 and 4(a) for the reductions in elk hiding cover and thermal cover, as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3.** Hunting opportunities would be maintained and based on the analysis presented above and the following rationale, adequate elk habitat would continue to be available within both units to support desired levels of elk. · Implementation would result in both short- and long-term increases in available forage on approximately eleven percent of the combined herd units, including increases on summer, transition and winter range. The increase in forage is expected to maintain or improve herd health. · There would be no increase in public access or changes to elk security habitat. · Within the combined herd units, approximately 93 percent of the existing hiding cover and 86 percent of the existing winter range thermal cover would be maintained. Cover would continue to be available within and adjacent to treatment units and across the landscape. · Past wildfires have greatly reduced project area elk habitat and much of the remaining habitat is at risk. Implementation of alternative 3 would reduce future wildfire risk.

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
		would reduce future wildfire risk. It is believed that active management is necessary to address fuel loading, species diversity and insect and disease concerns. Due to the predominance of mature forest, limited disturbance and reduced forage, some management is necessary to maintain herd health and increase elk populations within the elk management unit (MFWP 2004). Collectively, the treatments proposed under this alternative are designed to address these concerns and the long-term benefits associated with the increased forage availability and reduced wildfire risk, are believed to outweigh the risks associated with the anticipated reduction in cover.	It is believed that active management is necessary to address fuel loading, species diversity and insect and disease concerns. Due to the predominance of mature forest, limited disturbance and reduced forage, some management is necessary to maintain herd health and increase elk populations within the elk management unit (MFWP 2004). Collectively, the treatments proposed under this alternative are designed to address these concerns and the long-term benefits associated with the increased forage availability and reduced wildfire risk, are believed to outweigh the risks associated with the anticipated reduction in cover.
Mule Deer	Deer cover on winter, transition and summer ranges would be altered due to continued MPB mortality. Forage availability would increase somewhat but would continue to remain low, and over the long term, herd health would not be expected to improve. Adequate forage and cover would continue to be available to support existing populations and maintain hunting opportunities.	Treatments proposed under alternative 2 would reduce deer hiding and thermal cover and increase deer forage. Based on the analysis presented previously and the following rationale, adequate cover would continue to be available to support existing populations, whereas foraging availability would increase over the short and long term. Hunting opportunities would be maintained.	Treatments proposed under alternative 3 would reduce deer hiding and thermal cover and increase deer forage. Based on the analysis presented previously and the following rationale, adequate cover would continue to be available to support existing populations, whereas foraging availability would increase over the short and long term. Hunting opportunities would be maintained.
Migratory Species			
Migratory Birds	Migratory bird habitat would remain largely unchanged. This alternative complies with the MBTA.	Project design features are in place to maintain migratory bird habitat and reduce potential mortality. This alternative complies with the MBTA.	Project design features are in place to maintain migratory bird habitat and reduce potential mortality. This alternative complies with the MBTA.

Plants

Alternative 1 would have no new soil disturbing activities that would disturb sensitive plant populations. However, alternative 1 does not propose activities that modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Consequently, there remains a higher risk of a large, stand-replacing fire that could result in effects to herbaceous sensitive species habitat. Under alternative 1 whitebark pine would not increase in the short term and is expected to decline from present levels in the long term.

Alternatives 2 and 3 include soil disturbing activities with the potential to affect unknown herbaceous sensitive plant populations. Alternatives 2 and 3 address the purpose and need by proposing activities that modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Alternative 2 would affect more acres than alternative 3. The proposed actions are designed to reduce potential for stand-replacing wildfire events in the treated stands. Reducing potential for stand replacing events may reduce wildfire impacts to specific resources. Proposed activities under alternatives 2 and 3 are consistent with recommendations for restoration of whitebark pine ecosystems, and in treated areas whitebark pine would increase in the short term with the increase extending into the long term.

There are no known occurrences of herbaceous sensitive plants in the project area and there is a project design feature in place to protect whitebark pine; therefore, direct and indirect effects are limited. Cumulative effects are not expected to contribute to change in status or viability of sensitive plants, under any of the alternatives. No downward trend in population numbers or density, or downward trend in habitat capability that would reduce the existing distribution of any of the sensitive plant species discussed in this analysis, is expected under any of the alternatives.

Summary of determination of effects to sensitive plant species is displayed in the following table.

Species Common name	Alternative 1	Alternative 2	Alternative 3
Roundleaf orchid	MII*	MII	MII
Scalloped moonwort	MII	MII	MII
Peculiar moonwort	MII	MII	MII
Lesser yellow lady’s slipper	MII	MII	MII
Sparrow egg lady’s slipper	MII	MII	MII
Howell’s gumweed	MII	MII	MII
Hall’s rush	MII	MII	MII
Missoula phlox	MII	MII	MII
Whitebark pine	MII	MII	MII

*May impact individuals or habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species.

Noxious Weeds

While the spread of noxious weeds would continue under all alternatives, the rate of spread could potentially be faster in areas proposed for treatments, particularly areas to be thinned and burned. Potential impacts would be greatest under alternative 2 followed by alternative 3. Weed management would continue as in the past, however, activities proposed for the Stonewall Project add a layer of ground disturbance and therefore requires additional management for weeds. Areas of ground disturbance would be monitored for weed infestations and treated as appropriate, in accordance with the Helena National Forest Weed Treatment Project FEIS (USDA Forest Service 2006) and Best Management

Practices (BMPs) as specified in FSM 2080 (USDA Forest Service 2001), and the Forest Plan. Chemical weed treatment would be the primary treatment method in areas that are accessible by spray equipment. Biological control would apply in areas where the biological agents have optimal conditions for survival and expansion. In riparian areas, biological control would be emphasized where conditions for insect establishment are met. The effect of all treatment methods would be to control and contain existing and new infestations related to vegetation treatments.

Soil

The project area has a long management history that includes mining, grazing, and timber harvesting, which contributed to past ground disturbing activities that lead to the current conditions. The amount of detrimental soil disturbance in the units is mixed, but primarily is the result of past log landings and skid trails with the exception of four units that have residual effects from mining. The soils in the project area are generally coarse textured and resilient to compaction and erosion if operations take place during dry or frozen conditions. Ground cover is generally high in the project area and trending toward recovery where a thin organic layer exists. Coarse woody debris (CWD) levels also vary across units but are mostly within forest standards. There are multiple areas and units where large amounts of CWD signal a build-up of “locked-up” nutrients that are not plant or soil available.

Alternative 2 has the most proposed treatment acres, followed by alternative 3. The action alternatives would result in potentially detrimental soil disturbance. However, based on research and professional experience, the positive effects of reintroducing fire far outweigh negative potential effects from disturbing a larger acreage of land.

Watershed Resources

Primary water resource concerns stemming from this project include potential sediment conveyance to streams from project treatment units, and potential increased water yield due to removal of vegetation. Field sediment surveys identified road segments that were capable of delivering sediment to ephemeral, intermittent, or perennial stream channels. Under all project alternatives, overall reductions in sediment delivery to stream channels due to application of road BMPs and road obliteration are expected. Results suggest that under existing conditions, roughly 11 tons of sediment is delivered from roads to Lincoln, Beaver, and Keep Cool Creeks in an average year. With design features proposed in this project, sediment delivery from roads would remain one ton per year for Lincoln Creek, and reduce by about one ton each for Beaver and Keep Cool Creeks. Overall sediment delivery reduction for alternatives 2 and 3 during the project is estimated to be about 2 tons. While road improvement and road obliteration activities proposed in alternatives 2 and 3 may temporarily increase sediment delivery to stream channels, the design features proposed in this project would reduce sediment delivery to project area tributaries of the Blackfoot River over the long term, leading to improved conditions in project watersheds.

The project has the potential to increase water yield in Lincoln Creek, Beaver Creek, and Keep Cool Creek. A water yield increase above 10 to 15 percent may be of concern in that the flow increase could accelerate bank erosion. Water yield increase modeling results suggest a potential increase of 2 to 8 percent in the affected watersheds. The project, when combined with other recent past and reasonably foreseeable actions was predicted to result in a theoretical combined increase in water yield from project watersheds of about 5 percent at the confluence with the Blackfoot River. These levels are within State DEQ recommendations for TMDL and non-TMDL streams elsewhere on the Helena National Forest. If predicted water yield increases did occur, the modest additional flow would likely improve stream temperature and in-stream physical habitat, rather than cause any degradation. The project is unlikely to significantly affect the condition of riparian areas in the project area, given the 50- to 100-foot riparian no-ignition buffers in place for all action alternatives. The project is unlikely to affect the condition of any wetlands found in the project area, in that these areas would either be avoided entirely, or would be treated only by hand crews or by equipment during winter operating conditions.

In summary, the proposed project would have relatively minor impacts to water resources in the project watersheds under the action alternatives. Through implementation of design features and application of BMPs, the project alternatives would most likely reduce short- and long-term sediment delivery to stream channels, improving or maintaining water quality in the Blackfoot River headwaters watershed. Alternatives 2 and 3 would also reduce long-term sediment delivery through improving road BMPs at stream crossings. Water yield change due to proposed project activities is predicted to be at the margins of detectability and is not anticipated to have any deleterious effects on channel stability or water quality.

Fish habitat

Alternative 1 (no action) would not promote a change in existing conditions within the analysis area. While this alternative meets the Forest Plan direction of “no measurable effect”, it does nothing to help ensure movement toward desired conditions. Because many streams are currently nonfunctioning or functioning at risk, alternative 1, when considered with other current, past and reasonably foreseeable actions could work cumulatively with the management activities/natural events discussed above to limit the potential to achieve healthy population densities in certain populations.

Alternatives 2 and 3 would promote improvement in stream conditions through long-term reductions in sediment delivery and physical impacts to stream channels, which would promote positive shifts in stream function across the analysis area. Therefore, the effects of the Stonewall Vegetation Project proposed actions when considered cumulatively with other past, present and reasonably foreseeable actions should promote the attainment of better habitat conditions, and more abundant and resilient aquatic populations.

The analysis used a practical approach outlined in Ruggiero et al. (1994) and Region 1 guidance (Draft 01/30/2004) in conjunction with criteria established by Rieman et al. (1993). Selected habitat attributes considered both ecologically significant to fish and sensitive to land management disturbances are borrowed from Overton et al. (1995) and Region 1 guidance (Draft 1/30/2004). The population consists of both fluvial and resident components Pierce et al. (1997). Radio tracking of WCT indicates wide-ranging movements and use of various tributaries for spawning (Pierce et al. 2004). This analysis predicts a short-term change in substrate composition risks, some minor downward trend in incubation and fry emergence success (birth rate) to the population before recovering to an improved trend over baseline after 3 years. Western cutthroat trout recruitment is likely more than adequate to offset minor short-term sediment increases near the populations in Beaver Creek and Keep Cool Creek.

In the long term, treating hydrologically connected roads helps recover gravel quality slightly over baseline conditions. Therefore, there is some minimal risk to viability for this Western cutthroat trout population in the short term with a long-term trend of maintaining reproductive habitat within the acceptable range of variation.

The Biological Effects Determination for westslope cutthroat trout and western pearlshell mussel, if implementing alternative 2 or 3 is: **May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.**

The Biological Analysis Determinations for bull trout and bull trout critical habitat is: **May effect, not likely to adversely affect.**

Recreation

Alternative 1, no action would have no direct or cumulative effects to recreation resources. The purpose and need for the Stonewall Vegetation Project "…improving the mix of vegetation and structure across the landscape so that it is diverse, resilient, and sustainable to wildfire and insects; modifying fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape; enhancing and restoring aspen, western larch and ponderosa pine species and habitats; utilizing the economic value of trees through removal; and integrating restoration with socioeconomic considerations" would not be addressed. Potential long-term indirect effects to recreation resources would be due to the ongoing risk of severe wildfire that could lead to changes in the recreation settings, visual qualities and naturalness within the roadless expanse.

Alternatives 2 and 3 propose actions would have short-term direct effects to recreation resources during project implementation such as limited access to specific areas and increased presence of people and noise within the project area. Project design features are in place to limit potential affects. The proposed treatments would address the purpose and need for the Stonewall Vegetation Project, resulting in a more diverse, resilient and sustainable Forest ecosystem with reduction in risk of negative impacts from severe wildfire. Alternative 2 treats more acres and would have more effects than alternative 3. The long-term indirect effects to recreation would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area.

Cumulative effects to recreation resources would generally be short term, occurring during project implementation, and would relate to an increased presence of people, vehicles and the associated noise that may affect the recreation experience. Longer-term cumulative effects would impact the Pine Grove dispersed camping area, such as hazard tree removal and fence construction for a riparian exclosure, in addition to the actions proposed in the Stonewall Vegetation Project. These effects would remain until vegetation growth obscures the visible stumps from the vegetation treatment activities, approximately 3-5 years, but would remain consistent with Roaded Natural ROS class (p.5).

There would be no effects to the Lincoln Gulch IRA and fewer acres treated within the Bear-Marshall-Scapegoat-Swan IRA.

Inventoried Roadless Areas

Alternative 1, no action would have no direct or cumulative effects to roadless resources. Potential long-term indirect effects to roadless resources would be due to the ongoing risk of severe wildfire that could lead to changes in the recreation settings, visual qualities and naturalness within the roadless expanse.

Alternatives 2 and 3 would have short-term direct impacts to roadless resources during project implementation such as increased presence of people and noise within the project area. Project design features are in place to limit potential effects. The proposed treatments would result in a more diverse, resilient and sustainable forest ecosystem with a reduction in risk of negative impacts from severe wildfire. The long-term indirect effects from the action alternatives to roadless resources would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area. Alternative 2 proposes prescribed fire on 4,182 acres (about 0.5 percent) within the Bear Marshall Scapegoat Swan Inventoried Roadless Area and on 664 acres (about 3.8 percent) within the Lincoln Gulch Inventoried Roadless Area. Alternative 3 proposed on 3,565 acres (about 0.4 percent) within the Bear Marshall Scapegoat Swan IRA. The Lincoln Gulch Inventoried Roadless Area would not be treated.

Cumulatively there may be short-term impacts to solitude and undeveloped character with long-term benefits to naturalness throughout the IRA. Additional management activities within the IRA including travel planning, weed treatments and livestock grazing would also occur. These activities are compatible with the management of roadless resources and may cumulatively represent short-term impacts to solitude throughout the IRA due to the presence of people.

Visual

The characteristic landscape is expected to continue to perpetuate. Management activity viewed disturbances would increase when considering all viewed units proposed for treatment. However, with the project design features the VQOs would be met. Units where dead trees would be removed would ultimately look similar to the end result of the natural decay cycle. This alternative would decrease the length of time the dead trees are viewed in the landscape. Cumulative effects for this alternative are expected to be similar to alternative 2, with fewer acres impacted by alternative 3. Both action alternatives would allow the VQOs to be met and would be in compliance with the Forest Plan and other regulations with the implementation of the visual design features.

Cultural

The no-action alternative would have an undesired effect on cultural resources. Most significant of these is the increased risk of damage to cultural resources from catastrophic wildfires resulting in artifact damage, wooden structure and feature loss, and loss of site integrity through erosion.

Alternatives 2 and 3 could have both negative and positive impacts on cultural resources within the project area. There would be no adverse or negative effects with implantation of project design features and mitigation measures. The negative effects are the possibility of cultural resources damage from ground disturbance from the use of heavy machinery, log and tree removal, road construction, and the heat damage to resources from prescribed fires. The loss of vegetation can indirectly lead to vandalism to cultural resources because of the increased visibility. Project design features would mitigate adverse effects to cultural resources within the project area. Positive effects include the reduction of fuels that could result in fire damaged cultural resources and increased erosion of archaeological sites.

Alternatives 2 or 3 would meet the Helena National Forest management goals for cultural resources by reducing the risk of fire. Damages to cultural resources from wildfires, suppression efforts and erosion, are irreversible losses of cultural resources. With project design features the project is anticipated to have no adverse effect.

If additional cultural resources are discovered during implementation of this project, work should cease in the area and a Forest Archaeologist would be contacted. Work in the area could only resume if mitigation measures can be determined and/or re-evaluated if necessary.

Economic Financial Efficiency

Project feasibility and financial efficiency indicates that both action alternatives are financially inefficient (negative Present Net Value (PNV)) when including all activities associated with the analysis. Both action alternatives are feasible when considering only timber harvest and the required design criteria. Alternative 2 has the highest PNV for the timber harvest and required design criteria at positive $178 thousand and negative $1.2 million when considering all proposed activities. For alternative 3, the PNV for the timber sale and required design criteria is positive $68 thousand for the timber harvest and negative $1.1 million for all proposed activities. The no-action alternative has no costs or revenues associated with it.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no-action alternative would not harvest timber or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management (e.g., reduced fuel loadings for future reduced fire severity, improving vegetative species mix across the landscape) are nonmarket benefits.

Economic Impact

The no-action alternative would not change jobs or income because there are no proposed project activities associated with this alternative.

Alternative 2 proposes harvest of 22,022 hundred cubic feet (Ccf) of timber products and could result in a total of 171 jobs and labor income at $7.7 million over the life of the project. The annual effects are greatest with this alternative since it has the most timber harvest. If the harvest takes longer than anticipated, the total impacts would remain the same, but the annual contributions would be reduced. Approximately 134 direct, indirect and induced jobs and $6.6 million of labor income are associated with the proposed timber harvest activities, with the rest associated with restoration activities.

Alternative 3 proposes harvest of 14,299 Ccf of timber products could result in a total of 118 total jobs and labor income of $5.2 million over the life of the project. On an annual basis, this would amount to approximately 25 jobs per year over a period of 10 years, and $1.2 million annually in total labor income. Approximately 87 direct, indirect and induced jobs and $4.3 million of labor income would be associated with the timber harvest activities, with the rest associated with restoration activities.

Environmental Justice

More employment and labor income opportunities would be created by alternatives 2 and 3 when compared to no action. Implementation of any of the action alternatives would not likely adversely affect minority or low-income populations. Implementation of the no-action alternative maintains the status quo and provides no additional employment or income in the economic impact area.

The Executive Order also directs agencies to consider patterns of subsistence hunting and fishing when an action proposed by an agency has the potential to affect fish or wildlife. There are no Native American Reservations or designated Native American hunting grounds located in or near the analysis area. None of the alternatives restrict or alter opportunities for subsistence hunting and fishing by Native American tribes. Tribes holding treaty rights for hunting and fishing on the Helena National Forest are included on the project mailing list and have the opportunity to provide comments on this project.

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This section presents the biological, physical and socioeconomic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparing the alternatives as described in chapter 2.

This chapter is arranged by resource area, starting with an overall introduction to vegetation to provide the reader a better understanding of the overall vegetative condition. Following each resource description is a discussion of the potential effects (environmental consequences) to the resources associated with the implementation of each alternative. Potential effects, including direct, indirect, and cumulative effects are disclosed. Effects are quantified, where possible, and qualitative discussions are also included.

This analysis uses best available science, but recognizes that opposing science exists. A literature review of opposing science sent to the project by the public in scoping responses, and the Forest Service accompanying response, is available in the project record at the Lincoln Ranger District.

This DEIS incorporates by reference the resource specialist reports in the project record (40 CFR 1502.21). Specialist reports contain detailed data, executive summaries, regulatory framework, assumptions and methodologies, analyses, conclusions, maps, references, and technical documentation that the resource specialists relied upon to reach conclusions in the DEIS.

This DEIS incorporates the Forest Plan by reference and tiers to the FEIS completed for the Forest Plan, and amendments. The discussions of resources and potential effects take advantage of existing information included in the Forest Plan and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all project-specific information such as resource reports, ecosystem analyses, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is available for review by contacting the Helena National Forest office.

Analyzing Environmental Consequences

Environmental consequences are the effects of implementing an alternative on the biological, physical, economic, and social environment. The Council of Environmental Quality regulations implementing the National Environmental Policy Act include a number of specific categories to use for the analysis of environmental consequences. Several form the basis of much of the analysis that follows. They are explained briefly here.

Direct, Indirect, and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would occur in the foreseeable future. The project is expected to be active over approximately the next 7 to 10 years, or from the time the decision is made to full implementation. Cumulative effects result when the incremental effects of actions are added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Past activities contributed to the existing condition and are considered in the affected environment. Present and reasonably foreseeable future actions are assessed along with the effects of the proposed action to determine whether significant cumulative effects may occur. This analysis is consistent with the Council on Environmental Quality memo from James L. Connaughton titled “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis” dated June 24, 2005, incorporated by reference.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis considers the current environmental conditions as a reflection of the aggregate impact of all prior human actions and natural events that affected the environment and might contribute to cumulative effects.

The cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century, and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, we cannot focus on the impacts of past human actions and ignore the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008).

The Helena National Forest Schedule of Proposed Actions (SOPA) was reviewed and forest and district personnel consulted to identify current and reasonably foreseeable projects on the Lincoln Ranger District. Contacts were made with adjacent Forests for proposed activities to be considered for affected resources cumulative effects analysis.

Assessment areas vary by resource, and so do the other actions included in each cumulative effects analysis. Cumulative effects may include estimated effects from present logging (timber harvest, fuels treatments, road and landing construction and maintenance) and wildfire activities (e.g. suppression activities and the affected burn areas). Other actions may include but are not limited to grazing and fuels reduction and/or forest health projects in the vicinity.

Ongoing activities include annual road maintenance, recreation trail use for hiking and snowmobiling, dispersed camping, hunting, and appropriate responses for fire suppression. The past, present and reasonably foreseeable actions considered for this project analysis are displayed in appendix C on figure C-1 (map) with impacts noted in tables C-4, C-5, and C-6.

Vegetation

Introduction

In this section we describe the current vegetative condition and the factors shaping the current condition of the project area, as well as the desired condition and how the current vegetative condition relates to the desired condition. This section discusses how three alternative management scenarios would or would not move the vegetation from the current condition to or toward the desired condition. We discuss changes in stand density, stand structure, species composition and how those changes address the purpose and need for the project.

Methodology

In this section we identify information sources and assumptions used and briefly outline the analysis process.

Information Sources

A variety of information sources were used for qualitative and quantitative analysis. These information sources are listed below, and are explained in greater detail in volume 2, appendix B. Information sources used in this analysis includes:

- Individual treatment unit diagnosis from field reviews completed by Helena National Forest personnel and last updated in fall 2009. These can be found in project records.
- 30-meter Digital Elevation Model (DEM) Geographic Information Systems (GIS) raster layers from which we attained elevation, percent slope and aspect
- National Agricultural Imagery Program (USDA Farm Service Agency 2011) aerial photo digital imagery
- Forest Inventory and Analysis (FIA) grid-intensification sample plot data
- Formal stand exam data collected in 1989, 1991, and 2010 and housed in the Field Sampled Vegetation database
- Past management activity contained in the Forest Service Activity Tracking System (FACTS) database
- Site visits during summer 2010
- GIS spatial data acquired from the Helena National Forest including:
    - VMAP spatial data including classification for tree dominance type, tree canopy cover class, and tree diameter
    - Helena National Forest Plan (USDA Forest Service 1986) Management Area boundaries
    - 2001-2010 aerial insect and disease detection (ADS) survey data
    - Property ownership boundaries
    - Project area boundary
    - Historic wildfires
    - Past management activities

- ♦ Fire Regime Condition Class (FRCC) analysis data including classification for biophysical settings and vegetation-fuel classes
- ♦ Other literature representing the best available science referenced in this report.

Assumptions

A number of assumptions are made in any analysis. These assumptions range from very small to large in scope. In this analysis we do not include as assumptions that natural processes which are certain to happen will continue to happen. For example, succession is a natural process constantly occurring due to differences in plants abilities to colonize, survive, grow, and propagate as conditions change. The process of succession will always happen, however we do include as assumptions factors such as changes in climate conditions and the occurrence or non-occurrence of disturbances which can modify the direction of succession. Read more about assumptions in volume 2, appendix B.

Assumptions made in this analysis are listed below:

- Current Forest Plan and other pertinent management direction would continue indefinitely into the future
- In the long-term time frame of the analysis, no additional major disturbances, such as wildfire or bark beetle epidemics would occur, the analysis is of future risk and probable effects if the disturbance occurs and is not a future projection of the occurrence
- Climate change has occurred to some degree and will continue to occur in the future; ramifications of a changing climate are likely to be (Karl et al. 2009):
  - ♦ More of the winter precipitation will fall as rain
  - ♦ Snow levels will raise in elevation
  - ♦ Snow melt will occur earlier in the spring
  - ♦ The late-spring to summer dry season (fire season) will increase in length
  - ♦ Summer dry seasons will be drier and warmer
  - ♦ Prolonged drought periods will increase, but their occurrence will probably be variable
  - ♦ Storms will become more intense with a larger portion of annual precipitation falling in the heaviest storms
  - ♦ Night-time minimum temperatures will increase
  - ♦ Growing season and number of frost-free days will increase
  - ♦ Wildfires are likely to become more frequent and the area burned averaged annually likely greater
  - ♦ Weather conditions conducive to bark beetle mortality are likely to become more frequent
  - ♦ Climate changes will most likely bring about some change in site characteristics leading to climax plant community changes and so Biophysical Setting changes, but the direction and magnitude of the changes are unknown and would be very small within the time frame of this analysis
- FIA grid intensification plot data can provide reliable estimates of average vegetation attributes at a landscape level
- ADS data can provide a reasonable estimate of the magnitude and spatial location of tree damage and mortality on the landscape

- Intensive (formal) stand exam data provide the most accurate estimates of individual stand attributes
- Individual informal stand exams and diagnosis can provide reliable descriptions of stand conditions
- Formal and informal field exams from 2009 and 2010 represent the current condition and formal exam data taken before that time should be adjusted for bark beetle mortality
- The FACTS database contains the most current and accurate past management activity data
- The accomplishment time peiod is estimated to be 2015-2020
- No unforeseen occurrences such as fire, blowdown, or insect mortality would occur from 2010 until the time of implementation
- Forest Vegetation Simulator (FVS) modeling can provide a reasonable estimate of the magnitude and direction of proposed treatment effects on individual stands or on forest types
- Remote-sensed data such as VMap can provide reliable landscape-level estimates of forest conditions and can be informative at the stand-level if used with caution
- The Stonewall Vegetation Project area, at about 24,000 acres is sufficiently large to analyze and discuss landscape-level effects
- Landscape-level desired conditions contained in the Stone Dry Vegetation Report (Milburn et al. 2006) can also be directly applied to the Stonewall Vegetation Project area.

Analysis Process

In the following analysis we summarize the current condition and reference condition from the Stone Dry analysis as the current and desired condition in terms of Biophysical Setting (BpS) and vegetation-fuel class (VFC) for the landscape. We also display current conditions for several stands as examples of stand structures, species compositions, and stocking levels with discussion of how they do not represent the desired condition.

We analyzed alternative effects by comparing landscape-level changes in vegetation-fuel classes for each BpS due to treatment unit changes in vegetation-fuel class. We compare the effects of treatments qualitatively and we also model the effects of treatments on stand structure, species compositions, and stocking levels for representative stands using available formal stand exam data and the Forest Vegetation Simulator program. We also used the Forest Vegetation Simulator Fire and Fuels Extension with stand exam data and FIA grid-intensification plot data to model changes in crown bulk density, canopy base height, and percent canopy cover for use in modeling fire and fuel effects (Buhl 2015). See the Fire and Fuels section for a discussion of fire and fuels effects.

Overview of Issues Addressed

The purpose and need for the project includes:

- ♦ Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects
- ♦ Modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape
- ♦ Enhance and restore aspen, western larch, and ponderosa pine species and habitats
- ♦ Utilize economic value of trees with economic removal
- ♦ Integrate restoration with socioeconomic considerations

On August 26, 2011 Region 1 Regional Forester Leslie A. C. Weldon designated whitebark pine as a sensitive species in the Region. Direction following the designation includes considering the species in new analysis.

Indicators

Indicators used in this analysis to discuss how the alternatives would address the purpose and need for the project as well as issues relating to wildlife identified from public comments are:

- Within-stand changes in tree species compositions as a result of proposed treatments and the proportion of the analysis area on which quaking aspen, western larch, and ponderosa pine would increase in presence
- Landscape-level changes in species compositions as measured by the acres treated in each alternative with an emphasis on benefits to aspen, western larch, ponderosa pine, and whitebark pine
- Within-stand changes in stand structures and species compositions in terms of tree diameter distributions for proposed treatment type groups
- Landscape-level changes in stand structures in terms of Biophysical Setting (BpS) and vegetation-fuel classes as measured by the acres and proportion of change within each BpS/vegetation fuel class combination
- Forest health in terms of reduced susceptibility (increased resistance) of individual stands and the landscape to diseases and insects found within the project area of concern

Affected Environment

Stonewall Desired Condition

In 2006, the Lincoln Ranger District completed a vegetation report (Stone Dry Vegetation Report, Milburn et al. 2006) as part of an ecosystem analysis at the watershed scale (EWAS) for the Stone-Dry area that includes the Stonewall project area. In the analysis, they used the Fire Regime Condition Class (FRCC) system to describe reference vegetative, fuel and fire conditions and to compare them to current conditions based on site visits (Milburn et al. 2009, FRCC 2005). The FRCC analysis for the area was updated in 2010 (Olson 2010) including updates to the biophysical settings and vegetation-fuel classifications. See the discussion in chapter 1for more information about biophysical settings, vegetation fuel classes, habitat types, insects and diseases, and tree canopies.

Existing Condition

The existing condition of the 24,000 acre project area has been shaped by management activities including: (1) many years of fire suppression, (2) 3,473 acres of harvest/regeneration treatments that created an early-seral stage following the treatment and of which a few are still providing most of the early seral in the project area, and (3) 1,660 acres of other tree-cutting from 1950 to present. In natural fire events, 87 acres were burned in the Snow/Talon Fire (2003), and 261 acres were burned in the Keep Cool Fire (2006). In addition, natural processes such as succession, and natural events such as droughts are always occurring.

Table 10 that follows displays the existing condition information for proposed treatment units.

Table 10. Existing condition data for proposed treatment units

Description Group	Unit	Slope	Aspect	Elevation	Forest Type	Species Comp	Acres	Est. TPA O/S	Est. TPA U/S	Est. Ba	Average d.b.h.	Age	Mortality Rating
1	6	35-60	E	47-52	DF	50DF/45LP/5PP	14	200-450	300-400	80-180	12"	100-175	High
1	7	35-60	E	47-52	DF	50DF/45LP/5PP	17	200-450	300-400	80-180	12"	100-175	High
1	8	35-60	E	47-52	LP	60LP/40DF/tracePP	62	200-450	300-400	80-180	12"	100-175	Severe
1	15	40-55	SW	48	DF	75DF/20PP/5LP/trace AS/ES	15	250	400	80-180	16"	100-120	Low-High
1	23	40-55	E	48-52	LP	60LP/40DF	29	275	0-100	80-180	12"	140	Severe
1	24	30-40	NE	52-54	LP	50LP/40DF/trace WL/PP	5	300-400	Trace	120-180	12"	140	Severe
1	26	40-60	E, SE	50-56	DF	65DF/35LP/5PP/ES/ AF	65	300	Trace	120-200	14"	130	Severe
1	28	35	NW	53-55	LP	60LP/40DF	22	300	200-600	60-180	12"	120-150	Severe
1	30	15-45	E	52-57	DF	50DF/50LP	14	300	200-600	80-180	14"	85-150	High
1	31	15-45	E	52-57	DF	75DF/25LP/tracePP/ AS	16	300	200-600	80-180	14"	85-150	High
1	32	15-45	E	52-57	DF	75DF/25LP/tracePP/ AS	45	300	200-600	80-180	14"	85-150	High
1	33	45-55	NE	54-60	DF	60DF/40LP	17	400	200-600	140-200	14"	120	High
1	44	50	SW	48-56	DF	50DF/30PP/20LP	97	250-300	200	120-200	16"	120	High
1	45	50	SW	48-56	Mix	45LP/35DF/20PP	38	250-300	200	140-220	16"	120	Severe
1	46	0-30	SW	50	Mix	40DF/40LP/15PP/5A F/AS/ES	251	300	300-1000	80-200	16"	180-200	Severe
1	47	0-20	S	50	Mix	40DF/40LP/15PP/5A F/AS/ES	220	300	300-1000	80-200	16"	180-200	Severe
1	54	45-55	NE	54-60	DF	60DF/40LP	20	400	200-600	140-200	14"	120	High
1	55	35-55	NE, SE	60-64	DF	50DF/40LP/10AF	29	350	200	120	14"	130	High
2	3	0-20	E, SE	46	LP	60LP/15DF/25AS/trac eES	37	Trace	500	80-120	6"	45	Low
2	14	0-25	SW	48	Mix	30PP/30DF/15LP/10	11	400	200	40-100	9"	30	Low

Description Group	Unit	Slope	Aspect	Elevation	Forest Type	Species Comp	Acres	Est. TPA O/S	Est. TPA U/S	Est. Ba	Average d.b.h.	Age	Mortality Rating
						AS/5ES							
2	16	30-50	SW	48	DF	90DF/10LP	3	Trace	1000	0	2"	20-30	Low
2	18	0-25	SW	46-48	LP	95LP/5DF/tracePP/WL/AS	21	Trace	800-1000	0	2"	29	Low
2	21	0-25	SW	46-48	LP	95LP/5DF/tracePP/WL/AS	6	Trace	800-1000	0	2"	29	Low
2	48	20-35	SW	51-58	Mix	40PP/35LP/15DF	141	400-500	100	120-140	8"	41	Low
2	49	20-35	SW	50-52	Mix	40DF/30PP/15LP/5AS	49	400-500	100	120-140	8"	41	Low
2	50	35-45	SW	51-54	DF	50DF/40DF/5LP/5PP/AS	49	400-500	100	120-140	8"	41	Low
2	51	20-35	SW	48-50	Mix	40DF/30PP/15LP/5AS	193	400-500	100	120-140	8"	41	Low
2	59	<35%	E	60-62	LP	WL/AF/LP	16	Trace	600	N/A	4-6"	41	Low
2	60	<35%	N	46-50	LP	LP/DF/WL	25	Trace	400-500	N/A	1-2"	19	Low
2	61	<35%	NE	50-54	LP	LP/WL/DF	34	Trace	600-800	N/A	2-3"	29	Low
2	62	<35%	NW	52-57	DF	DF/LP/AS	37	Trace	600-800	N/A	2-4"	12-20	Low
2	63	<35%	E	57-62	LP	LP/AF/DF	17	Trace	600-800	N/A	8"	41	Low
2	64	<35%	N, NE	53-60	LP	LP/AF/WL	30	Trace	600	N/A	1-2"	19	Low
2	65	<35%	NE	56-60	LP	LP/AF/DF	25	Trace	600-800	N/A	2-4"	44	Low
2	66	<35%	NE	52-56	AF	AF/WL/LP	26	Trace	800	N/A	1-2"	19	Low
2	67	<35%	NE	49-52	LP	LP/DF/WL	20	Trace	400-500	N/A	1-2"	19	Low
2	68	<35%	NE	57-59	LP	LP/DF/WL	15	Trace	400-500	N/A	1-2"	19	Low
2	69	<35%	E	50-55	LP	LP/DF/WL	31	Trace	400-500	N/A	1-2"	19	Low
2	70	<35%	E	48-51	LP	LP/DF/WL	39	Trace	400-500	N/A	1-2"	22	Low
2	71	<35%	SE	50-52	LP	LP/DF/WL	40	Trace	400-500	N/A	1-2"	22	Low
2	72	<35%	SE	48	LP	LP/ES/AF	85	Trace	800	N/A	2-9"	49	Low
2	73	<35%	SE	46-50	PP	PP/DF/LP	33	Trace	600	N/A	4-8"	44	Moderate
2	75	<35%	Flat	49	DF	DF/LP/PP	148	Trace	600	N/A	2-4"	27	Low

Description Group	Unit	Slope	Aspect	Elevation	Forest Type	Species Comp	Acres	Est. TPA O/S	Est. TPA U/S	Est. Ba	Average d.b.h.	Age	Mortality Rating
3	1	0-35	E, NE	44-48	LP	80LP/20DF/trace PP/AS	96	300-400	200-1000	100-240	12-14"	75-95	Severe
3	9	0-30	NE,E	50-52	LP	85LP/15DF/traceAF	18	300-400	200-300	140	12"	100	Severe
3	11	0-10	NE	45	Mix	30LP/20AS/20PP/20DF/10ES	23	250	200-700	120-200	16"	85/30	Severe
3	12	0-10	NE	46	LP	50LP/20AS/10DF/15ES/5PP	80	300	200-600	120-140	14"	85/30	Severe
3	13	20-40	E	47	LP	85LP/15DF/traceAS/ES/AF	41	350	300-700	100-220	14"	100	Severe
3	20	5-35	SW	46-48	LP	80LP/20PP/traceDF/AS	32	250-400	200-600	120-200	16"	100	Severe
3	22	40-55	N	48-50	LP	65LP/30DF/5PP/trace WL/AS	30	350	200	180	14"	140	Severe
3	25	40-55	E	52-55	LP	75LP/25DF/traceAF	29	200-400	300	180	14"	120	Severe
3	29	10-35	E	50-55	LP	70LP/30DF	25	200	400-1000	80-180	11"	100	High
3	34	35-50	SE	54-60	LP	55LP/40DF/5AF	12	300	100-400	80-180	14"	130	Severe
3	39	5-25	E to SW	48-53	LP	80LP/15DF/5AF/ES/PP	42	400	100-1000	100-260	12"	110	Severe
3	40	5-25	E to SW	48-53	LP	80LP/15DF/5AF/ES/PP	11	400	100-1000	100-260	12"	110	Severe
3	41	5-25	E to SW	48-53	LP	80LP/15DF/5AF/ES/PP	12	400	100-1000	100-260	12"	110	Severe
3	42	5-25	E to SW	48-53	LP	80LP/15DF/5AF/ES/PP	65	400	100-1000	100-260	12"	110	Severe
3	43	5-25	E to SW	48-53	LP	80LP/15DF/5AF/ES/PP	104	400	100-1000	100-260	12"	110	Severe
3	53	35-50	SE	54-60	LP	55LP/40DF/5AF	17	300	100-400	80-180	14"	130	Severe
3	57	5-20	SW	50-53	Mix	30PP/30DF/30LP/10AS	93	300	200	80-160	8"	47	Severe
3	58	15-35	SW	53-55	Mix	30PP/30DF/30LP/10AS	15	300	200	80-160	8"	47	Severe

Description Group	Unit	Slope	Aspect	Elevation	Forest Type	Species Comp	Acres	Est. TPA O/S	Est. TPA U/S	Est. Ba	Average d.b.h.	Age	Mortality Rating
4	10	5-15	NE	46-48	LP	90LP/5DF/5PP	18	300	250-700	120-140	14"	100	Severe
4	17	5-25	SW	48	LP	70LP/15DF/15PP/traceES/WL	38	200-300	300	120-220	16"	100	Severe
4	19	5-35	SW	46-48	LP	80LP/20PP/traceDF/AS	15	250-400	200-600	120-200	16"	100	Severe
4	27	35-50	NE, SE	52-55	LP	60LP/40DF/tracePP/WL	31	400	50-75	100-160	14"	120-140	Severe
4	35	45-55	NE	55-57	LP	85LP/10DF/5AF/ES	24	450	300-900	100-200	12"	120-140	Severe
4	36	35-65	NE, SE	56-59	LP	90LP/10DF/traceES/AF	20	300-400	200	100-200	14"	130	Severe
4	37	20-55	E	58-64	LP	80LP/20DF/traceAF	8	300-400	300-500	140-180	13"	130	Severe
4	38	20-55	E	58-64	LP	80LP/20DF/traceAF	7	300-400	300-500	140-180	13"	130	Severe
4	52	20-55	E	58-64	LP	80LP/20DF/traceAF	22	300-400	300-500	140-180	13"	130	Severe
4	56	35-55	NE, SE	60-64	LP	80LP/15DF/5AF	17	350	200	120	14"	130	Severe
4	74	<35%	SE	50-53	LP	75LP/25DF/traceAF	23	200-400	300	100-120	9-11"	120	Severe
5	4	0-30	E, SE	45-48	Mix	40LP/25ES/25DF/10AS/tracePP	7	250	400	200	10"	90	High
5	5	0-30	E, SE	45-48	Mix	40LP/25ES/25DF/10AS/tracePP	18	250	400	200	10"	90	High
6	2	25-55	E, SE	46-53	DF	60DF/30PP/10LP	146	100-400	100	40-180	14"	100-250	High
6	76	Variable	Variable		DF	70DF/20LP/5AF/5WB	123	Variable	Variable	Variable	Variable	Variable	High
6	78	Variable	Variable		DF	70DF/10PP/10LP	38	Variable	Variable	Variable	Variable	Variable	High
6	85	Variable	Variable		DF	80DF/5PP/5LP/traceAF	143	Variable	Variable	Variable	Variable	125	Low
7	80	Variable	Variable		DF	80DF/10PP/5LP/traceAS	326	Variable	Variable	Variable	Variable	Variable	Low
7	86	Variable	Variable		DF	90DF/10PP/traceAS	47	Variable	Variable	Variable	Variable	Variable	Moderate

Description Group	Unit	Slope	Aspect	Elevation	Forest Type	Species Comp	Acres	Est. TPA O/S	Est. TPA U/S	Est. Ba	Average d.b.h.	Age	Mortality Rating
7	87	Variable	Variable		LP	60LP/35DF/5AS	36	Variable	Variable	Variable	Variable	Variable	Moderate
8	77	Variable	Variable		LP	50LP/5AF/30DF/10PP	736	Variable	Variable	Variable	Variable	Variable	Low-High
8	79	Variable	Variable		LP	50LP/40DF/10PP/AS/WB/AF	337	Variable	Variable	Variable	Variable	Variable	Low-High
8	81	Variable	Variable		DF	70DF/15PP/15LP	629	Variable	Variable	Variable	Variable	Variable	Low-High
8	82	Variable	Variable		LP	70LP/15AF/15WB	776	Variable	Variable	Variable	Variable	Variable	Low-High
8	83	Variable	Variable		LP	70LP/15AF/15WB	457	Variable	Variable	Variable	Variable	Variable	Low-High
8	84	Variable	Variable		DF	50DF/50LP/5PP/trace AF	831	Variable	Variable	Variable	Variable	Variable	Low-Severe
8	88	Variable	Variable		LP	50LP/20DF/20AF/10 WB	892	Variable	Variable	Variable	Variable	Variable	Low-Severe

Asp – Aspect code: NE-northeast, E-east, SE-southeast, S-south, SW-southwest, W-west, NW-northwest

Elev – Elevation in 100's of feet

Forest Type Code: DF-Douglas-fir, LP-lodgepole pine, Mix-mixed species, PP-ponderosa pine, AF-subalpine fir

Species Comp – Tree species and percent composition:

- AF-subalpine fir
- AS-aspen
- DF-Douglas-fir
- ES-Engelmann spruce
- LP-lodgepole pine
- Mix-mixed species
- PP-ponderosa pine
- WB-whitebark pine
- WL-western larch

Est TPA O/S – Estimated trees per acre (TPA) overstory: Est TPA U/S – Estimated trees per acre understory

Est BA – Estimated basal area in ft^2/acre

Ave d.b.h. – Estimated average diameter at breast height (d.b.h.) in inches

Age – Estimated stand age: Mortality rating: Severe – estimated more than one-half of basal area dead, High – estimated from one-quarter to one-half of basal area dead, Low – estimated up to one-quarter of basal area dead

Habitat Types

The project area is heavily dominated by subalpine habitat types which cover about 69 percent of the area, Figure 17 and Table 11. Second in presence are Douglas-fir habitat types which cover about 18 percent of the area. Whitebark pine-subalpine fir and spruce habitat types each cover only about 0.3 percent of the area. The rest of the area is covered by rock, grass, meadows, water or private land.

For the habitat type coverage in the project area, species such as ponderosa pine, lodgepole pine, quaking aspen, western larch, and whitebark pine are always or almost always a seral species, and as such would decline in presence and eventually die out of the stands without disturbance (Pfister et al.1977, Fischer and Bradley 1987). Douglas-fir would be seral to subalpine fir on about 69 percent of the area. More discussion of habitat types is in chapter 1.

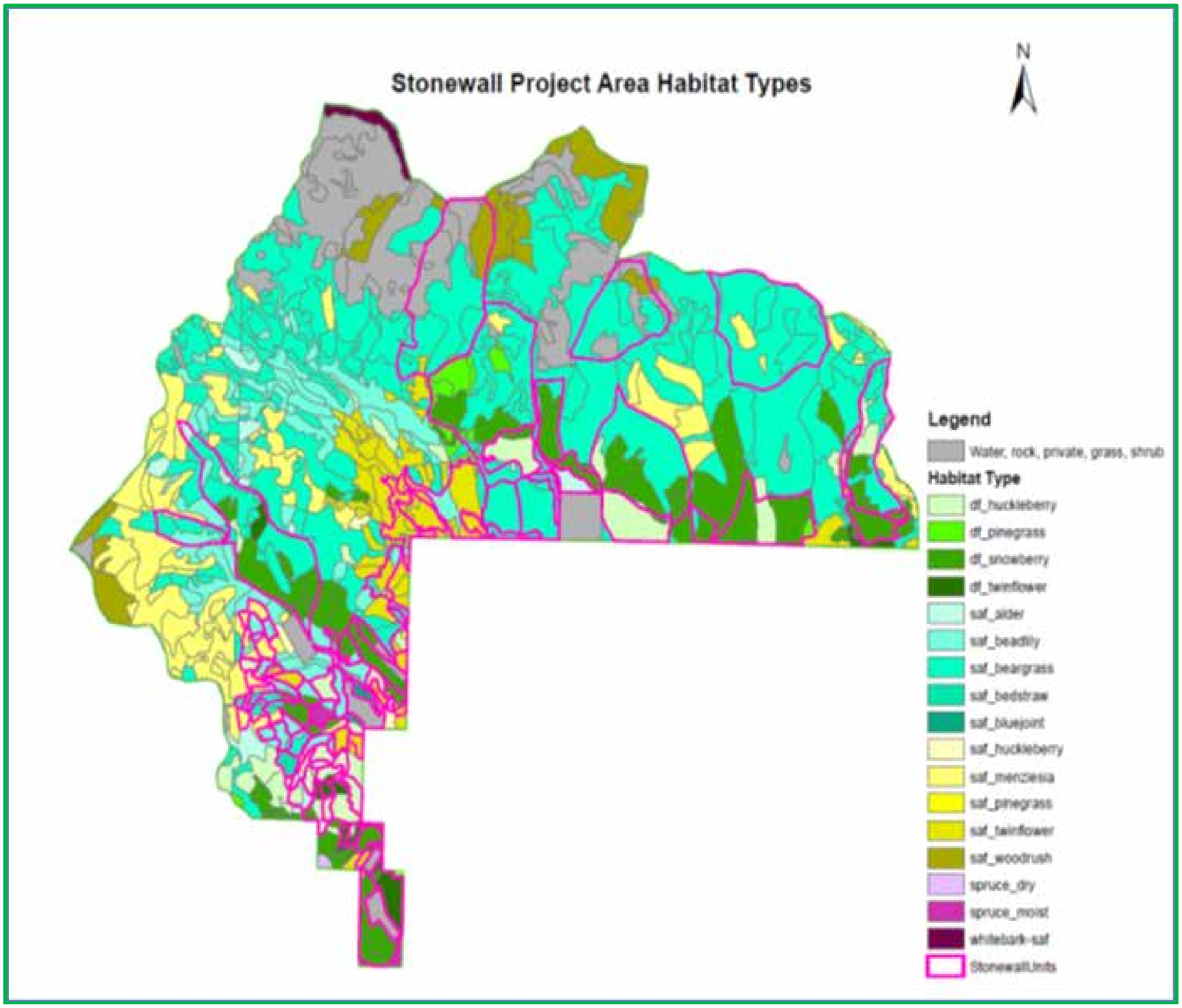

Figure 17. Stonewall project area habitat types and units

Table 11. Habitat types for each prescription group and treatment unit

Prescription Group	Unit Number	Habitat Type	Acres
1	6	Douglas-fir/huckleberry	3
1	6	Douglas-fir/twinflower	11
1	7	Douglas-fir/huckleberry	7
1	7	Douglas-fir/twinflower	10
1	8	Douglas-fir/huckleberry	46
1	8	Douglas-fir/twinflower	15
1	15	Douglas-fir/snowberry	10
1	15	subalpine fir/queencup beadlily	3
1	23	subalpine fir/queencup beadlily	8
1	23	subalpine fir/beargrass	21
1	24	Douglas-fir/huckleberry	5
1	26	Douglas-fir/snowberry	39
1	26	subalpine fir/beargrass	14
1	26	subalpine fir/menziesia	12
1	28	Douglas-fir/huckleberry	21
1	30	Douglas-fir/twinflower	13
1	31	Douglas-fir/huckleberry	15
1	32	Douglas-fir/huckleberry	22
1	32	Douglas-fir/snowberry	10
1	32	Douglas-fir/twinflower	10
1	32	subalpine fir/Sitka alder	3
1	33	subalpine fir/queencup beadlily	13
1	33	subalpine fir/huckleberry	2
1	44	unknown	17
1	44	Douglas-fir/snowberry	80
1	45	unknown	12
1	45	Douglas-fir/snowberry	22
1	45	subalpine fir/beargrass	3
1	46	Douglas-fir/pinegrass	3
1	46	subalpine fir/queencup beadlily	54
1	46	subalpine fir/beargrass	25
1	46	subalpine fir/twinflower	169
1	47	Douglas-fir/huckleberry	2
1	47	Douglas-fir/snowberry	2
1	47	subalpine fir/beargrass	215
1	54	subalpine fir/queencup beadlily	18
1	54	subalpine fir/menziesia	2
1	55	subalpine fir/queencup beadlily	9
1	55	subalpine fir/menziesia	18
2	3	Douglas-fir/snowberry	33
2	3	Douglas-fir/twinflower	3

Prescription Group	Unit Number	Habitat Type	Acres
2	14	trees-rock	9
2	16	Douglas-fir/snowberry	2
2	18	Douglas-fir/huckleberry	20
2	21	Douglas-fir/huckleberry	6
2	48	Douglas-fir/huckleberry	103
2	48	Douglas-fir/snowberry	22
2	48	subalpine fir/beargrass	17
2	49	Douglas-fir/snowberry	6
2	49	subalpine fir/Sitka alder	43
2	50	Douglas-fir/snowberry	46
2	51	Douglas-fir/huckleberry	181
2	51	Douglas-fir/snowberry	9
2	51	subalpine fir/beargrass	3
2	59	subalpine fir/menziesia	16
2	60	subalpine fir/twinflower	25
2	61	Douglas-fir/huckleberry	33
2	62	Douglas-fir/huckleberry	20
2	62	subalpine fir/Sitka alder	17
2	63	subalpine fir/menziesia	17
2	64	subalpine fir/menziesia	30
2	65	subalpine fir/queencup beadlily	3
2	65	subalpine fir/menziesia	22
2	66	subalpine fir/queencup beadlily	2
2	66	subalpine fir/twinflower	25
2	67	subalpine fir/queencup beadlily	20
2	68	subalpine fir/queencup beadlily	13
2	68	subalpine fir/menziesia	2
2	69	subalpine fir/bedstraw	31
2	70	Douglas-fir/huckleberry	39
2	71	subalpine fir/queencup beadlily	9
2	71	spruce-moist	30
2	72	subalpine fir/twinflower	85
2	73	Douglas-fir/huckleberry	33
2	75	subalpine fir/beargrass	145
2	75	subalpine fir/twinflower	2
3	1	Douglas-fir/snowberry	5
3	1	Douglas-fir/twinflower	88
3	1	pvt	2
3	9	Douglas-fir/huckleberry	18
3	11	Douglas-fir/huckleberry	12
3	11	subalpine fir/bluejoint	9
3	12	unknown	79

Prescription Group	Unit Number	Habitat Type	Acres
3	13	unknown	2
3	13	Douglas-fir/huckleberry	3
3	13	subalpine fir/queencup beadlily	32
3	13	trees-rock	2
3	20	Douglas-fir/snowberry	20
3	20	subalpine fir/twinflower	12
3	22	subalpine fir/queencup beadlily	27
3	22	subalpine fir/menziesia	2
3	25	subalpine fir/queencup beadlily	23
3	25	subalpine fir/beargrass	4
3	25	subalpine fir/menziesia	2
3	29	Douglas-fir/huckleberry	20
3	29	Douglas-fir/twinflower	5
3	34	Douglas-fir/huckleberry	3
3	34	subalpine fir/queencup beadlily	2
3	34	subalpine fir/twinflower	7
3	39	Douglas-fir/huckleberry	12
3	39	subalpine fir/beargrass	4
3	39	subalpine fir/pinegrass	4
3	39	subalpine fir/twinflower	21
3	40	subalpine fir/beargrass	9
3	41	subalpine fir/beargrass	10
3	41	subalpine fir/twinflower	2
3	42	Douglas-fir/pinegrass	3
3	42	subalpine fir/queencup beadlily	19
3	42	subalpine fir/beargrass	10
3	42	subalpine fir/twinflower	32
3	43	Douglas-fir/pinegrass	6
3	43	subalpine fir/queencup beadlily	7
3	43	subalpine fir/twinflower	92
3	53	subalpine fir/queencup beadlily	13
3	53	subalpine fir/menziesia	4
3	57	Douglas-fir/snowberry	93
3	58	Douglas-fir/snowberry	15
4	10	subalpine fir/twinflower	18
4	17	subalpine fir/queencup beadlily	28
4	17	trees-rock	8
4	19	subalpine fir/twinflower	15
4	27	Douglas-fir/snowberry	12
4	27	subalpine fir/queencup beadlily	18
4	35	Douglas-fir/snowberry	5
4	35	subalpine fir/queencup beadlily	18

Prescription Group	Unit Number	Habitat Type	Acres
4	36	subalpine fir/beargrass	15
4	36	subalpine fir/menziesia	5
4	37	subalpine fir/beargrass	6
4	37	subalpine fir/menziesia	2
4	38	subalpine fir/beargrass	7
4	52	subalpine fir/queencup beadlily	3
4	52	subalpine fir/beargrass	12
4	52	subalpine fir/menziesia	7
4	56	Douglas-fir/huckleberry	14
4	56	subalpine fir/queencup beadlily	2
4	74	Douglas-fir/huckleberry	15
4	74	subalpine fir/Sitka alder	6
5	4	Douglas-fir/twinflower	7
5	5	Douglas-fir/twinflower	9
5	5	subalpine fir/twinflower	9
6	2	Douglas-fir/snowberry	134
6	2	Douglas-fir/twinflower	3
6	2	subalpine fir/twinflower	2
6	2	spruce-moist	5
6	76	subalpine fir/queencup beadlily	48
6	76	subalpine fir/beargrass	68
6	76	subalpine fir/menziesia	7
6	78	Douglas-fir/snowberry	30
6	78	subalpine fir/queencup beadlily	8
6	85	Douglas-fir/snowberry	106
6	85	subalpine fir/beargrass	37
7	80	Douglas-fir/huckleberry	66
7	80	Douglas-fir/pinegrass	14
7	80	Douglas-fir/snowberry	243
7	80	subalpine fir/beargrass	3
7	86	Douglas-fir/snowberry	35
7	86	subalpine fir/beargrass	13
7	87	Douglas-fir/huckleberry	7
7	87	Douglas-fir/snowberry	8
7	87	subalpine fir/beargrass	11
7	87	subalpine fir/menziesia	5
7	87	subalpine fir/twinflower	6
8	77	Douglas-fir/huckleberry	17
8	77	Douglas-fir/snowberry	256
8	77	Douglas-fir/twinflower	32
8	77	pvt	5
8	77	subalpine fir/Sitka alder	25

Prescription Group	Unit Number	Habitat Type	Acres
8	77	subalpine fir/queencup beadlily	24
8	77	subalpine fir/beargrass	349
8	79	Douglas-fir/huckleberry	72
8	79	Douglas-fir/snowberry	76
8	79	grass-trees	8
8	79	subalpine fir/beargrass	180
8	81	Douglas-fir/huckleberry	43
8	81	Douglas-fir/snowberry	238
8	81	subalpine fir/beargrass	349
8	82	subalpine fir/beargrass	724
8	82	subalpine fir/menziesia	48
8	82	subalpine fir/twinflower	3
8	83	rock	57
8	83	subalpine fir/beargrass	295
8	83	subalpine fir/woodrush	31
8	83	trees-rock	74
8	84	Douglas-fir/huckleberry	2
8	84	Douglas-fir/pinegrass	168
8	84	Douglas-fir/snowberry	159
8	84	grass-trees	14
8	84	subalpine fir/beargrass	466
8	84	subalpine fir/menziesia	21
8	88	Douglas-fir/pinegrass	6
8	88	rock	51
8	88	subalpine fir/beargrass	471
8	88	subalpine fir/twinflower	11
8	88	subalpine fir/woodrush	101
8	88	trees-rock	225

Biophysical Settings

Biophysical Settings are land delineations based on the physical setting, (e.g., elevation and aspect) and the potential vegetation community that can occupy the setting. A national team has established in the FRCC system a set of descriptions for BpS found within regions of the United States (FRCC 2005). HNF ecologists, fuel specialists, and silviculturists reviewed the BpS descriptions applicable to the Stone Dry area and determined that the descriptions could be used for the Stone Dry area without modification (Milburn et al. 2009). For the Stone Dry analysis, HNF personnel spatially assigned BpS based upon habitat type (Milburn et al. 2009). Table 12 identifies acres of biophysical settings by unit.

Table 12. Unit biophysical setting acreages

Unit	Biophysical Setting	Acres
1	Barren	3
1	Ponderosa Pine-Douglas-fir	134
10	Ponderosa Pine-Douglas-fir	44

Unit	Biophysical Setting	Acres
11	Ponderosa Pine-Douglas-fir	50
12	Ponderosa Pine-Douglas-fir	130
13	Ponderosa Pine-Douglas-fir	95
14	Ponderosa Pine-Douglas-fir	47
15	Ponderosa Pine-Douglas-fir	51
16	Ponderosa Pine-Douglas-fir	12
17	Ponderosa Pine-Douglas-fir	95
18	Ponderosa Pine-Douglas-fir	62
19	Ponderosa Pine-Douglas-fir	50
2	Barren	5
2	Mountain Grassland with Shrubs	2
2	Mountain Shrubland	0
2	Ponderosa Pine-Douglas-fir	178
20	Ponderosa Pine-Douglas-fir	72
21	Ponderosa Pine-Douglas-fir	23
22	Ponderosa Pine-Douglas-fir	84
23	Mountain Grassland with Shrubs	3
23	Mountain Shrubland	5
23	Ponderosa Pine-Douglas-fir	50
24	Mountain Grassland with Shrubs	7
24	Ponderosa Pine-Douglas-fir	14
25	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	21
25	Mountain Grassland with Shrubs	3
25	Ponderosa Pine-Douglas-fir	53
26	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	33
26	Mountain Grassland with Shrubs	2
26	Ponderosa Pine-Douglas-fir	96
27	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	3
27	Ponderosa Pine-Douglas-fir	77
28	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	13
28	Ponderosa Pine-Douglas-fir	50
29	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	3
29	Ponderosa Pine-Douglas-fir	60
3	Ponderosa Pine-Douglas-fir	68
30	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	2
30	Ponderosa Pine-Douglas-fir	40
31	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	5
31	Ponderosa Pine-Douglas-fir	46
32	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	39
32	Mountain Shrubland	0

Unit	Biophysical Setting	Acres
32	Ponderosa Pine-Douglas-fir	58
33	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	23
33	Mountain Grassland with Shrubs	2
33	Ponderosa Pine-Douglas-fir	25
34	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	31
34	Ponderosa Pine-Douglas-fir	4
35	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	53
35	Ponderosa Pine-Douglas-fir	6
36	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	42
36	Ponderosa Pine-Douglas-fir	5
37	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	28
38	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	9
38	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	21
39	Ponderosa Pine-Douglas-fir	67
4	Ponderosa Pine-Douglas-fir	30
40	Ponderosa Pine-Douglas-fir	29
41	Ponderosa Pine-Douglas-fir	34
42	Ponderosa Pine-Douglas-fir	126
43	Ponderosa Pine-Douglas-fir	204
44	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	3
44	Ponderosa Pine-Douglas-fir	185
45	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	25
45	Ponderosa Pine-Douglas-fir	74
46	Ponderosa Pine-Douglas-fir	365
47	Ponderosa Pine-Douglas-fir	284
48	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	14
48	Mountain Shrubland	1
48	Ponderosa Pine-Douglas-fir	223
49	Ponderosa Pine-Douglas-fir	79
5	Ponderosa Pine-Douglas-fir	37
50	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	15
50	Mountain Shrubland	1
50	Ponderosa Pine-Douglas-fir	89
51	Barren	4
51	Ponderosa Pine-Douglas-fir	242
52	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	68
52	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	2
53	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	40
53	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	2
54	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	53

Unit	Biophysical Setting	Acres
54	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	2
55	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	21
55	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	46
56	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	10
56	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	38
57	Ponderosa Pine-Douglas-fir	173
58	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	21
58	Ponderosa Pine-Douglas-fir	29
59	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	19
59	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	37
6	Ponderosa Pine-Douglas-fir	57
60	Ponderosa Pine-Douglas-fir	58
61	Ponderosa Pine-Douglas-fir	65
62	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	50
62	Ponderosa Pine-Douglas-fir	27
63	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	43
63	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	24
64	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	49
64	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	2
64	Ponderosa Pine-Douglas-fir	30
65	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	50
65	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	4
65	Ponderosa Pine-Douglas-fir	3
66	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	33
66	Ponderosa Pine-Douglas-fir	41
67	Mountain Grassland with Shrubs	14
67	Mountain Shrubland	2
67	Ponderosa Pine-Douglas-fir	41
68	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	29
68	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	15
68	Ponderosa Pine-Douglas-fir	5
69	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	16
69	Mountain Grassland with Shrubs	20
69	Mountain Shrubland	5
69	Ponderosa Pine-Douglas-fir	39
7	Ponderosa Pine-Douglas-fir	39
70	Ponderosa Pine-Douglas-fir	70
71	Ponderosa Pine-Douglas-fir	90
72	Ponderosa Pine-Douglas-fir	158
73	Barren	3

Unit	Biophysical Setting	Acres
73	Ponderosa Pine-Douglas-fir	63
74	Mountain Grassland with Shrubs	7
74	Ponderosa Pine-Douglas-fir	72
75	Ponderosa Pine-Douglas-fir	195
76	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	88
76	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	74
76	Ponderosa Pine-Douglas-fir	29
77	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	335
77	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	369
77	Ponderosa Pine-Douglas-fir	224
78	Ponderosa Pine-Douglas-fir	90
79	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	208
79	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	111
79	Mountain Grassland with Shrubs	1
79	Ponderosa Pine-Douglas-fir	96
8	Barren	3
8	Ponderosa Pine-Douglas-fir	136
80	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	106
80	Ponderosa Pine-Douglas-fir	317
81	Barren	4
81	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	264
81	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	333
81	Ponderosa Pine-Douglas-fir	202
81	Interior West Lower Subalpine Forest	3
82	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	150
82	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	503
82	Mountain Grassland with Shrubs	23
82	Ponderosa Pine-Douglas-fir	5
82	Interior West Lower Subalpine Forest	237
83	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	109
83	Mountain Grassland with Shrubs	37
83	Mountain Shrubland	4
83	Interior West Lower Subalpine Forest	359
83	Interior West Upper Subalpine Forest	64
84	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	410
84	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	296
84	Mountain Grassland with Shrubs	8
84	Mountain Shrubland	3
84	Ponderosa Pine-Douglas-fir	245
84	Interior West Lower Subalpine Forest	21

Unit	Biophysical Setting	Acres
85	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	86
85	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	62
85	Ponderosa Pine-Douglas-fir	84
86	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	3
86	Ponderosa Pine-Douglas-fir	78
87	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	29
87	Ponderosa Pine-Douglas-fir	104
88	Barren	1
88	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	154
88	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	334
88	Mountain Grassland with Shrubs	41
88	Mountain Shrubland	16
88	Ponderosa Pine-Douglas-fir	2
88	Interior West Lower Subalpine Forest	384
88	Interior West Upper Subalpine Forest	86
9	Ponderosa Pine-Douglas-fir	42

Table 13. Treatment group biophysical settings

Prescription Group	Biophysical Setting	Acres	Percent of Group
1	Barren	3	0.1
1	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	216	11.6
1	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	48	2.6
1	Mountain Grassland with Shrubs	14	0.8
1	Mountain Shrubland	5	0.3
1	Ponderosa Pine-Douglas-fir	1571	84.6
2	Barren	7	0.3
2	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	318	14.6
2	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	82	3.7
2	Mountain Grassland with Shrubs	34	1.5
2	Mountain Shrubland	10	0.4
2	Ponderosa Pine-Douglas-fir	1729	79.4
3	Barren	9	0.5
3	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	116	6.8
3	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	2	0.1
3	Mountain Grassland with Shrubs	5	0.3
3	Mountain Shrubland	0	0.0
3	Ponderosa Pine-Douglas-fir	1564	92.2

Prescription Group	Biophysical Setting	Acres	Percent of Group
4	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	186	29.5
4	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	88	14.0
4	Mountain Grassland with Shrubs	7	1.1
4	Ponderosa Pine-Douglas-fir	350	55.4
5	Ponderosa Pine-Douglas-fir	68	100.0
6	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	173	33.8
6	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	136	26.5
6	Ponderosa Pine-Douglas-fir	204	39.7
7	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	138	21.6
7	Ponderosa Pine-Douglas-fir	499	78.4
8	Barren	5	0.1
8	Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	1520	26.9
8	Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	2056	36.4
8	Mountain Grassland with Shrubs	110	1.9
8	Mountain Shrubland	23	0.4
8	Ponderosa Pine-Douglas-fir	773	13.7
8	Interior West Lower Subalpine Forest	1005	17.8
8	Interior West Upper Subalpine Forest	150	2.7

Insects and Diseases

Bark beetles, such as mountain pine beetle and Douglas-fir beetle described below, are a natural part of forest ecosystems. They function as catalysts of forest succession by killing larger trees thus promoting understory tree species and replacing senescent stands, particularly in lodgepole pine. Dead trees also provide habitat for cavity nesters, course woody debris for streams, and soil benefits such as nutrient recycling and moisture retention (Samman et al. 2000; Byler and Hagle 2000). The objectives of bark beetle management are to minimize landscape-level expanses of overstocked, homogeneous forests of susceptible age and species composition that lead to catastrophic die-offs such as experienced in the last decade. These conditions were largely due to fire suppression.

Mountain Pine Beetle

The role of mountain pine beetle in ecosystems where lodgepole pine is seral is to remove the larger, dominant lodgepole pine and increase growing space for understory late-seral species such as subalpine fir and Douglas-fir, hastening succession (Amman 1977). Mountain pine beetle in these ecosystems also plays a role in converting stands from even-aged and single-story to uneven-aged and multi-story (Cole and Amman 1980).

Mountain pine beetle (MPB) infestations are closely related to host tree age, size, and density. Larger diameter trees are attacked by mountain pine beetle at higher rates than smaller diameter trees, and trees less than 5 inches d.b.h. have very low levels of attack (Cole and Amman 1969, Roe and Amman 1970, Cole and Amman 1980, Klein et al. 1978). VMap data shows that before the recent MPB outbreak, about 5,300 acres (22 percent of the project area) was dominated by lodgepole or ponderosa pine in or greater than a 5 to 9.9 inches d.b.h. size class. This could be considered a substantial portion of the landscape susceptible to mountain pine beetle, and does not include the area containing lodgepole or ponderosa pine where they are not dominant. Available stand data from recently examined stands in the project area containing lodgepole pine that has been severely impacted by MPB had average diameters greater than 8 inches d.b.h. (table 10).

Mountain pine beetle risk increases in lodgepole pine stands with an average age greater than 80 years old (Amman et al. 1990). Available stand data indicates that examined stands in the project area containing lodgepole severely impacted by mountain pine beetles had stand ages greater than 80 (table 10).

Mountain pine beetle risk also increases with stand stocking levels (Larsson et al. 1983, Anhold and Jenkins 1987, Negrón et al. 2008, Obedzinski et al. 1999, Oliver 1995, Olsen et al. 1996, Schmitz et al. 1981) and the proportion of stocking in susceptible species. In terms of basal area stocking Olsen et al. (1996) found greater MPB mortality in ponderosa pine where tree density exceeded 200 TPA and where BAs were between 150 and 250 ft^2, Larson et al. (1983) found an attack threshold in ponderosa pine of about 91 ft^2, Amman and Logan (1998) described a basal area of 80 ft^2/acre in lodgepole pine as a threshold for susceptibility. Available stand data indicates that examined stands in the project area containing lodgepole severely impacted by mountain pine beetles had stand basal areas greater than 80 (table 10).

Available research indicates that mountain pine beetle epidemics continue until the available bark beetle habitat is sufficiently reduced that epidemic levels can no longer be sustained (Cole and Amman 1969, Roe and Amman 1970, Cole and Amman 1980, Klein et al. 1978, Mitchell and Preisler 1991). Available stand data from 2009 and 2010 show that most of the larger, mature lodgepole pines are dead. Given this, we suspect that the recent mountain pine beetle epidemic in the project area has probably peaked is now declining because the supply of host trees has been depleted. Ponderosa and whitebark pine are also present in the project area and extensive mortality has also been recorded on those species.

Douglas-fir Beetle

Characteristics such as poor growth and stand density have been shown to be related to Douglas-fir beetle mortality (Negrón 1998). Maintaining tree vigor and reducing moisture stress is important to reducing bark beetle hazard in interior Douglas-fir (Furniss and Carolin 1977, Schmitz and Gibson 1996).

Douglas-fir beetle tends to attack trees that are mature or overmature, large-diameter, and in densely-stocked stands (Schmitz and Gibson 1996, Furniss et al. 1979, Reid and Glubish 2001, Garrison-Johnson et al. 2003).

Higher stand density and high density in Douglas-fir results in higher mortality with basal area of Douglas-fir being the best predictor variable for basal area (BA) killed (McMillin and Allen 2000, Negrón et al. 2001). Weatherby and Thier (1993) developed a rating model for Douglas-fir beetle which included stand basal areas of greater than 27.5 m^2/ha (119 ft^2) and proportion of stand basal area in Douglas-fir greater than 50 percent integrated which stand age and average tree size as thresholds for susceptibility. Randall and Tensmeyer (1999) developed a hazard rating system for the Inland Northwest integrating average Douglas-fir d.b.h., average stand age, stand BA and Douglas-fir percent of stand BA. In their system, if percent stand BA in Douglas-fir was 30-50, and stand BA 120 to 250 then hazard was high. For values greater than those resulted in hazard being very high.

Douglas-fir beetle prefers old trees because of their abundance of food and lower defense mechanisms and so the oldest, largest trees are the most susceptible. Furniss (1962), when studying the infestation patterns of Douglas-fir beetle that trees from 150 to 250 years old were exclusively attacked. Weatherby and Thier (1993) used an age of 120 years as a threshold for susceptibility in their DBF risk rating system.

Randall and Tensmeyer (1999) used an average stand age of 80-120 years as a parameter for a hazard rating of moderate, with age greater than 120 a parameter for a hazard rating of high or greater.

Douglas-fir beetle shows a preference for attacking large-diameter trees. Negrón (1998) noted that they rarely attack trees less than 6 inches d.b.h. Weatherby and Thier (1993) included a stand average d.b.h. of all Douglas-firs greater than 9 inches d.b.h. as a threshold for susceptibility in their DFB risk rating system. Randall and Tensmeyer (1999) used an average Douglas-fir diameter of 10-14 inches d.b.h. a parameter for a hazard rating of moderate, with greater than 14 a parameter for a hazard rating of high or greater.

Also, damage by fires has been shown to initiate Douglas-fir beetle attack. Douglas-fir injured by fires, especially by crown scorch, attract and can be susceptible to DFB (Furniss 1965, Cunningham et al. 2005, Hood and Bentz 2007). Cunningham et al. (2005) found that 1 year after a fire event the Douglas-fir beetle selected and attacked large-diameter Douglas-fir with 60–80 percent bole char, 60–80 percent crown volume scorch, and 50–70 percent probability of mortality due to fire. Hood and Bentz (2007) found that beetles were attracted to trees with high levels of crown scorch but not cambium injury. Hood and Bentz (2007) study also suggested that that tree size, stand conditions, and host availability were slightly more important in determining the likelihood of beetle attacks than fire injuries sustained by trees.

ADS data suggests that DFB is present at endemic levels. Stand-level data is available for only a portion of the stands within the project area and so we did not be model DFB hazard on the landscape. We discuss DFB hazard on the landscape from available exam data and the effects of alternatives on DFB hazard in individual treatment units.

Available data does show that many heavily forested stands in the project area contain mature Douglas-fir which is susceptible to bark beetles. Of the FVS grid-intensification plots in the project area, 60 percent could be classified as high hazard under Randall and Tensmeyer’s (1999) rating scheme.

Western Spruce Budworm

Western spruce budworm’s (*Choristoneura fumiferana*) primary hosts are Douglas-fir, Engelmann spruce, and true firs. Western spruce budworm (WSB) feeds on foliage, staminate flowers and developing cones (Fellin and Dewey 2012). WSB infestations can be prolonged, widespread and destructive. Regeneration and young stands are particularly vulnerable when growing beneath a canopy of overstory trees because larvae disperse from the overstory and feed on the small trees below. WSB’s greatest impact in mature stands is reduced growth, although repeated defoliation sometimes results in top-killing and tree mortality. Multi-story, dense stands are especially prone to developing high levels of WSB and susceptible to WSB damage (Carlson and Wulf 1989). Trees severely defoliated by the WSB may be predisposed to one or more species of tree-killing bark beetles, mainly the Douglas-fir beetle, and the fir engraver beetle (*Scolytus ventralis*). Budworm populations are usually regulated by combinations of several natural factors such as insect parasites, vertebrate and invertebrate predators, and adverse weather conditions. If stands become heavily defoliated during prolonged outbreaks, starvation can become important in regulating WSB populations (Fellin and Dewey 2012).

Swetnam and Lynch (1993) studied WSB outbreaks in New Mexico from 1690 to 1989 using tree ring records and found that WSB outbreaks tended to be cyclical with periods varying from 20-33 years, duration within stands of about 11 years. They observed that budworm activity in the 1900’s was unusually severe and tended to be more synchronous among stands than during earlier centuries, which they suggested was due to changes in stand structures due to man’s influence. Ryerson et al. (2003) in a reconstruction of SPB in the San Juan Mountains, Colorado, did not find significant 20th-century changes in the frequency of outbreak occurrence or magnitude of growth reduction.

Acreage affected by WSB declined in 2010 yet continues to be present in the project area. Many of the stands in the project area are multi-story and dense, with a high proportion of the stocking being in susceptible species. Of the FIA grid-intensification plots, 60 percent have greater than one-half of the BA stocking in WSB host species and in another 20 percent, although BA stocking of WSB host species is less than 50 percent, the TPA stocking in host species is high due to the large number of small trees. Additionally, all of the stands surveyed via FIA grid-intensification plots can be considered multi-story; that is, exhibiting tree canopies that are differentiated into layers at two or more vertical levels, a structure conducive to sustaining budworm populations and damaging understory trees or regeneration.

White Pine Blister Rust

White pine blister rust (*Cronartium ribicola*) has led to a rapid and precipitous decline in whitebark pine throughout Montana (appendix B). Five units proposed for prescribed burning (Units 76, 79, 82, 83, 88) are shown in available data to contain whitebark pine. Although little data is available concerning the condition of whitebark pine in those units, Forest and Inventory Analysis data for the Helena NF recorded white pine blister rust on about 19 percent of the live whitebark pine trees in the plots. However, blister rust surveys of whitebark pine in two stands south of the Stonewall project area on the Helena National Forest done in 2007 and 2009 found 74 and 97 percent WPBR infection levels (see WBP Survey_granite.xls and WBP Survey_redmtn6253.xls in project records). Given that the purpose of the blister rust surveys was to closely examine trees for the presence of blister rust, we suspect infection levels within the project area to be closer to the survey values than that shown in FIA data. Also, given the widespread presence and impacts of the disease throughout the Intermountain West (appendix B), there is no reason to believe that the condition is not similar to other places in the state.

Dwarf Mistletoe

Dwarf mistletoes (DMT, *Arceuthobium spp*.) are a family of native parasitic plants that extract water and nutrients from living conifers. DMT reduces tree vigor, causing irregular branching, branch kill, and top kill. Premature death eventually follows, usually aided by secondary bark beetles (Hawksworth and Johnson 1989). The parasitic activity of DMT causes reduced tree diameter and height growth, decreased cone and seed production, direct tree mortality, or predisposition of other pathogens and insects (Geils et al. 2002). In the long term, DMT in heavily invested seral-species stands can accelerate the shift toward climax non-host tree species (Geils et al. 2002). Stand data shows that in the project area, lodgepole pine is being affected in many stands by *A. americanum* at levels ranging from light to heavy. In most of the stands the infected overstory has been recently killed by MPB but remaining smaller understory lodgepole is probably infected also.

Armillaria

Stand data indicates that several stands contain root rot pockets, probably by armillaria root disease (*Armillaria ostoyae*) although the stand data did not definitively establish armillaria as the cause. The root rot pockets appear to be generally small. Armillaria root disease can result in tree mortality, growth reduction and wood decay.

Armillaria can infect all conifers found in the area, but susceptibility varies between the species. The general descending order of susceptibility to armillaria root disease is: ponderosa pine, lodgepole pine, Douglas-fir, western larch, Engelmann spruce, and subalpine fir (McDonald et al. 1987). Tree growth and vigor also affects susceptibility to armillaria, although study results are mixed. Filip and Goheen (1995) found that precommercially thinning 10- to 20-year-old mixed species stands significantly increased tree growth but after 10 years, difference in crop-tree mortality between thinned and unthinned stands was not statistically significant. In ponderosa pine, Filip and Goheen (1995) found that 20 years following precommercial thinning, crop-tree mortality in unthinned plots was twice that of thinned plots. In the same plots, Filip et al. (2009) found that seven years after commercial thinning was in leave trees less than thinned plots than in unthinned plots. Armillaria root rot is difficult to control because disease is nearly impossible to eliminate from a site (Rippy et al. 2005). The impacts of armillaria root disease can be reduced by:

- Favoring more resistant/tolerant tree species.
- Maintaining tree species diversity.
- Reforesting stands with locally adapted species suitable to the site.
- Promoting tree vigor by minimizing stress and avoiding wounds.
- Reducing inoculum sources through the uprooting of stumps and removal of woody debris

See more about tree mortality and damage for proposed units from insects and disease in chapter 1.

Stand Structures and Species Compositions

It can be useful to display stand species compositions and structures through the use of “diameter distributions” which display the number of trees present within diameter ranges. In this analysis, we display example stand diameter distributions in terms of trees-per-acre (TPA) within 2-inch diameter-at-breast-height (d.b.h.) classes. Note that within the diameter distribution scheme used in this analysis, what is displayed as the “1-inch” d.b.h. class displays the TPA for trees less than a 1-inch d.b.h.; the 2-inch d.b.h. class displays TPA for trees greater than or equal to 1 inch and less than three inches, and so on. The 1-inch d.b.h. class is often not displayed because the large number of trees in that class makes it difficult to see the species compositions of larger d.b.h. classes.

Figure 18 displays the diameter distribution for Stand 42303130. The stand has an estimated 1,442 total TPA live with 610 in the 1-inch class (not displayed) and 201 TPA dead due largely to the recent bark beetle outbreak (not displayed). The stand has about 167 ft^2 of basal area. The distribution is a very steep “reverse-J” shape with large numbers of trees in the smallest d.b.h. classes indicating that it is multi-story with a dense understory.

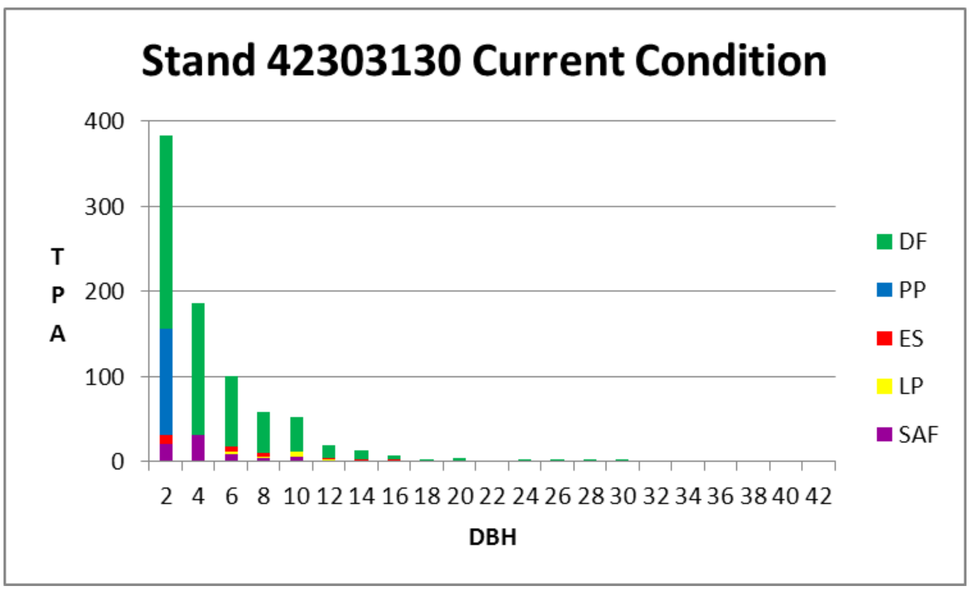

Figure 18. Stand 42303130 current condition diameter distributions

Figure 19 displays the diameter distribution for a plantation in the Stonewall Project Area. The species composition and diameter distribution suggests that the stand was planted to ponderosa pine and Douglas-fir, the trees forming the 4-inch to 10-inch d.b.h. class. The trees in the 1-inch and 2-inch d.b.h. classes are likely naturally established.

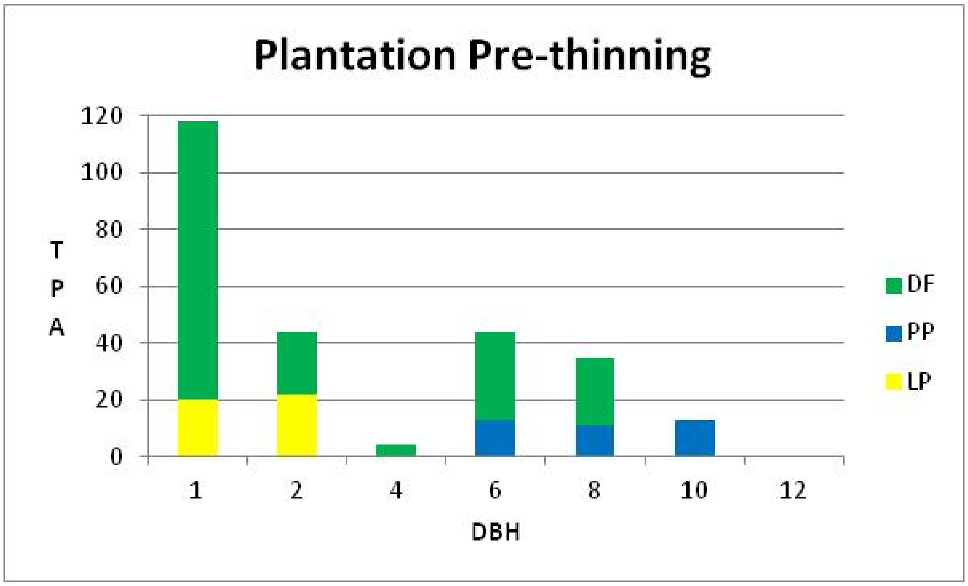

Figure 19. Plantation current condition diameter distributions

Figure 20 displays the current condition of Stand 41502088 in the Stonewall Project area. Dead and live trees are displayed to show the degree of mortality due to the recent mountain pine beetle outbreak. Most of the larger lodgepole pines have been killed. The stand is proposed for a harvest/regeneration treatment in this analysis.

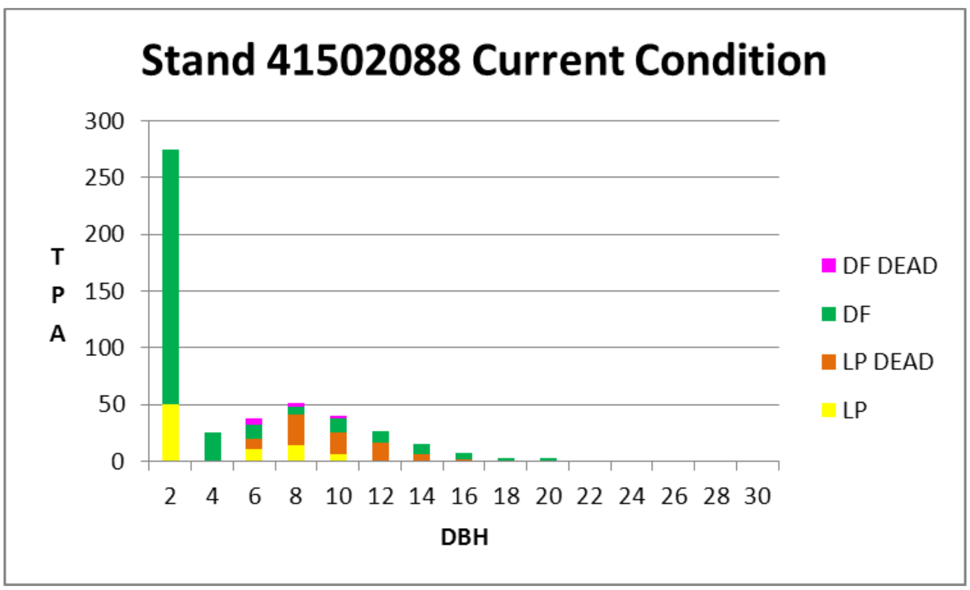

Figure 20. Stand 41502088 current condition diameter distributions

Figure 21 and figure 22 display the current condition of Stand 42502089 in the Stonewall Project area. Only live trees are displayed. The stand currently has 317 TPA and 110 ft^2 BA. Figure 22 displays the diameter distribution with the smallest size class removed so that the minor lodgepole pine and ponderosa pine components show up better. The figures display a stand average species composition but it should be noted that the distribution of ponderosa pine and lodgepole pine in the stand area was very clumpy. Mortality in the stand shows an average of 4 TPA dead for lodgepole and ponderosa pine and 15 TPA dead for Douglas-fir greater than 10 inches d.b.h. The low average mortality for ponderosa and lodgepole pine reflects the proportion of stocking in the stand. Other stand data indicates that most of the larger lodgepole within the stand have died. The mortality for Douglas-fir indicates that Douglas-fir beetle may have impacted the stand in the last few years.

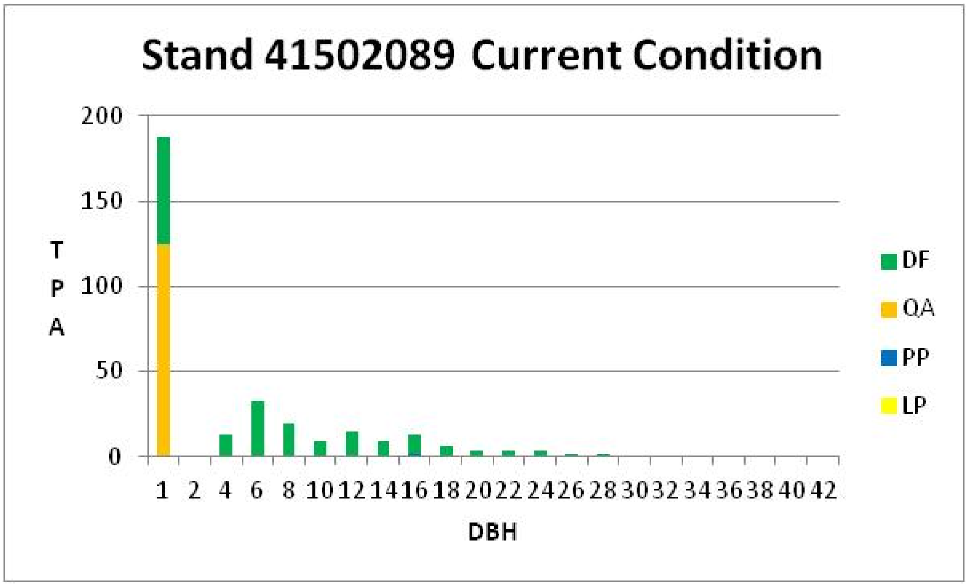

Figure 21. Stand 41502089 current condition diameter distributions all d.b.h. classes

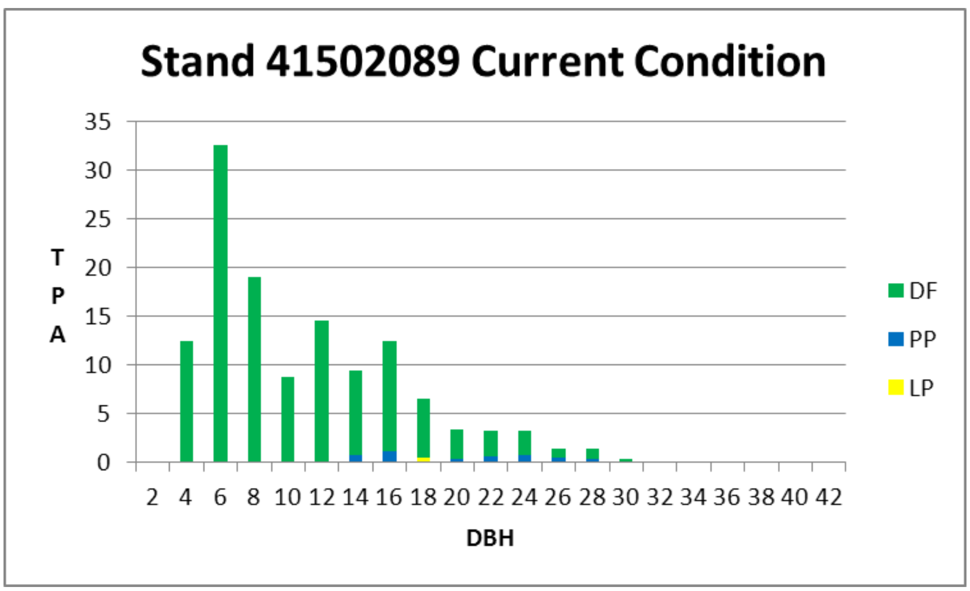

Figure 22. Stand 41502089 current condition diameter distribution without 1-inch d.b.h. class

Figure 23 displays the diameter distribution for Stand 415020066. Live and dead trees are displayed. The stand has about live 717 TPA and 187 feet^2 BA. It is proposed to have a pre-commercial thin and to have dead trees removed in the Stonewall Project.

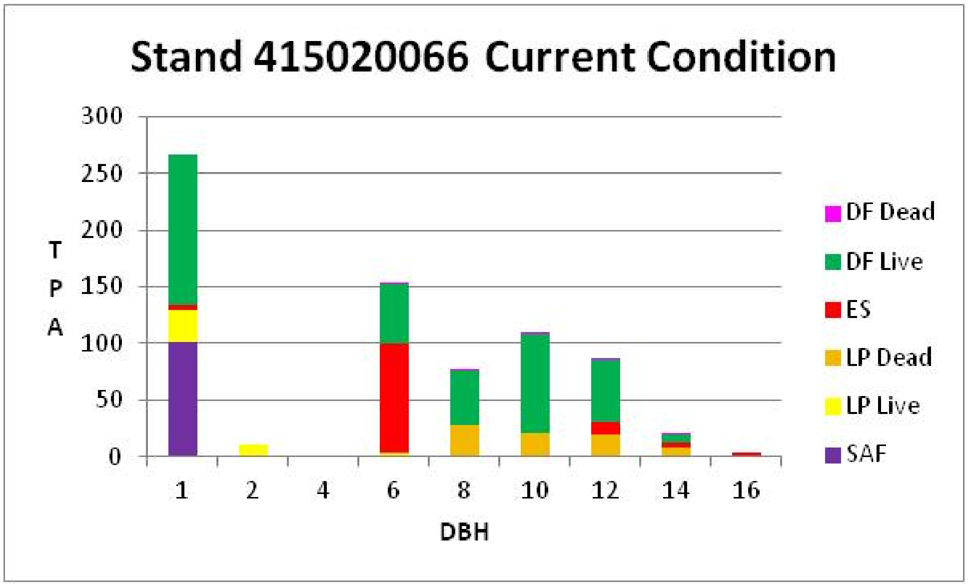

Figure 23. Stand 415020066 current condition diameter distributions

Figure 24 displays the diameter distribution for Stand 41502043. Live and dead trees are displayed. The stand has about live 385 live TPA, 126 dead TPA and 90 ft^2 BA. It is proposed to be thinned under alternative 2 and underburned under alternative 3 in the Stonewall Project.

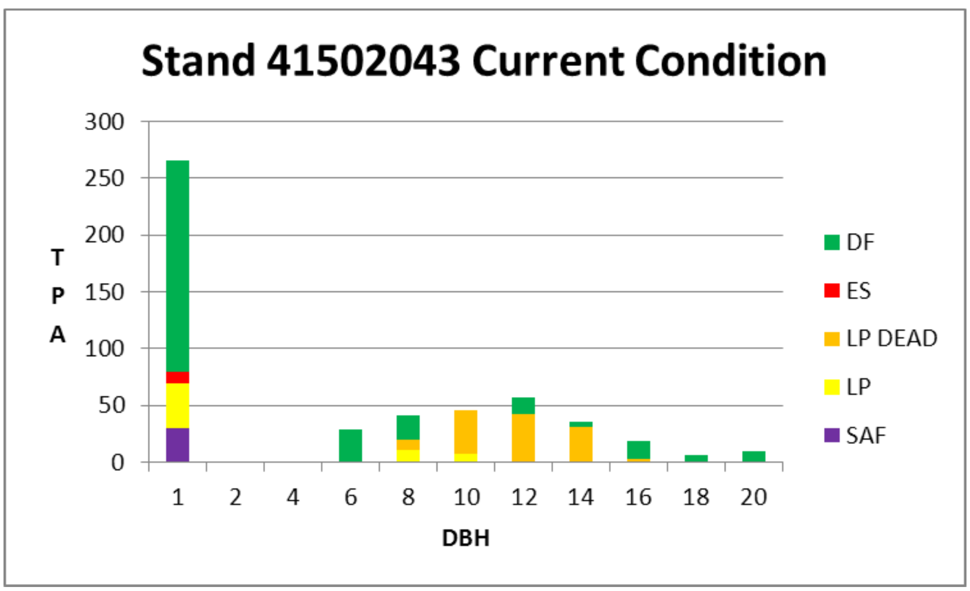

Figure 24. Stand 41502043 current condition diameter distribution

Figure 25 displays the diameter distribution for Stand 415020056. Live and dead trees are displayed. The stand has about live 575 live TPA, 239 dead TPA and 73 ft^2 BA. It is proposed to be regenerated under alternative 2 and underburned under alternative 3 in the Stonewall Project.

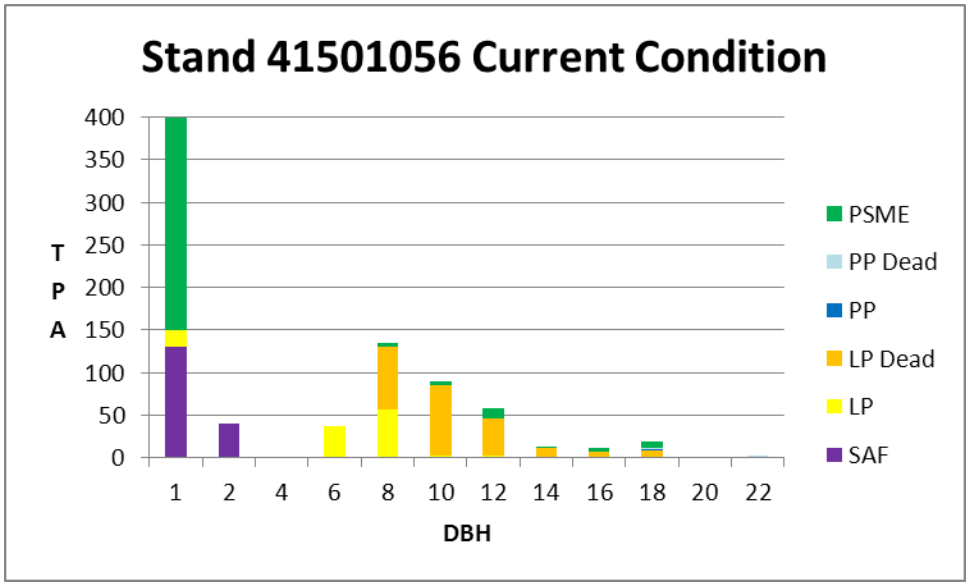

Figure 25. Stand 41501056 current condition diameter distributions

Tree Species of Interest

Ponderosa Pine

VMap data classifies 147 acres (about 0.6 percent) of the project area as having ponderosa pine as the dominant tree species with greater than 40 percent of the total tree canopy cover. About 32 percent of the area is within the Ponderosa pine/Douglas-fir BpS indicating that following the FRCC system based upon the physical setting and potential vegetation community we could expect to find ponderosa pine in a substantial portion of the area. Exams are available for only a portion of the project area, but available exams in proposed treatment units show ponderosa pine as a minor component (less than10 percent of stocking) in about 23 percent of the proposed treatment area and as a substantial component (equal to or greater than10 and less than 40 percent) on about 37 percent of the proposed treatment area.

The available data indicates that ponderosa pine is present on a substantial portion of the landscape, roughly ranging from about 32 to 60 percent, but is the major species on a very small portion of the landscape. The ponderosa pine can be considered as a seral species.

Quaking Aspen

VMap data does not show any quaking aspen-dominated stands within the project area which indicates that quaking aspen within the project did not dominate in sufficiently large area to be classified as the VMap data was created. Available exam data shows that aspen can be found in a number of units proposed for treatment, but always as a minor component. Although not observed and recorded in stand exams, very small aspen clones may be found in other units. The aspen can be considered seral to either subalpine fir or Douglas-fir, depending upon the unit and site. In many unit exams, the aspen is simply recorded as being present, as rare, or as a trace; while in several other units it comprises a substantial, although still minor, portion of the stocking(e.g.. Unit 3). Comments concerning the aspen in unit exams range from “suppressed in the understory” to “vigorous in the overstory, but proportionally not much suckering.” In general, we can characterize aspen in proposed units and the project area as: (1) small clones, (2) heavily competing with to suppressed by conifers, and (3) a minor stand component (with a few exceptions).

Western Larch

VMap data does not classify any area as being dominated by western larch indicating that the species is not present in sufficient quantities to be classified. Western larch is present in the project area, but available exam data for proposed treatment units shows the species as a minor component on about 3 percent of the proposed treatment area, except for one stand, which is a plantation. Available data, then, suggests that western larch is a very minor component on the landscape and in almost all stands, but many sites in the area could probably support it.

Whitebark pine

VMap data shows whitebark pine as the dominant tree species on about four percent of the project area, most in the highest elevations in the north side of the area. Available data mentions the species as present in treatment within Groups 6, 7, and 8, (Units 76, 79, 82, 83, 88) and although not recorded in available treatment unit diagnosis sheets (see analysis file), available FIA grid intensification plots in the project area recorded whitebark pine as present within about 11percent of the plots. There are only 16 FIA grid intensification plots within the project area, but they are uniformly distributed whereas the treatment units, except for the treatment units listed above, are generally lower elevation.

As stated above, a substantial portion (19 percent) to most (74 to 97 percent) of the whitebark pine on the Helena NF area can be considered infected by white pine blister rust (appendix B). In all FIA plots on the Helena NF, about 27 percent of the whitebark pine trees recorded were dead.

Whitebark pine in the Stonewall Project units is considered seral to subalpine fir. On sites where it is a seral species in the Northern Rocky Mountains, whitebark pine depends upon fire to maintain its dominance or presence (Arno 2001, Keane 2001, Kendall and Keane 2001, Morgan and Murray 2001). In the absence of fire, subalpine fir has increased in presence, and the combination of increases in subalpine fir and whitebark pine mortality and lack of regeneration due to white pine blister rust and mountain pine beetle have resulted in a decline in whitebark pine.

Environmental Consequences

Spatial and Temporal Context for Effects Analysis

We used three spatial scales for the effects analysis that follows. The spatial scale used depends upon the measurement indicator discussed. First, we discuss treatment effects on individual trees or classes of trees, for example, the increase in growth, vigor or size of small aspen clones due to the removal of competing conifers. Second, we discuss treatment effects on stand-level or unit-level attributes, for example, changes in species compositions. Third, we discuss treatment effects on a landscape scale, for example, the mixture of stand structures over the landscape. We chose the project area as the largest spatial scale for this analysis because it includes all Forest System land that: (1) includes the proposed treatment areas, (2) is bounded on the north, northwest, and west sides by drainage divides, and (3) at about 24,000 acres, is sufficiently large to analyze and discuss effects to forest vegetation on a landscape-level without 'diluting' the magnitude of the effects with a large area.

The year 2010 is the existing condition baseline used for this analysis. Proposed treatment stands were last examined in fall 2009 and 2010, briefly visited in summer 2010, and the last ADS survey used in this analysis was done in 2010. Short-term effects refer to effects over the 10-year period from the time the activity was accomplished which, for the purpose of modeling in this analysis, is assumed to be the year 2012 (although we do not know exactly when the activity would be accomplished). Long-term effects refer to effects from 10 to 50 years from the time the activity was accomplished. All pertinent past activities and events are incorporated into the previous existing condition discussion. In the cumulative effects analysis that follows, cumulative effects are discussed as changes in the existing condition due to present and future activities, including the effects of the alternative being discussed.

Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Past Activities

Past activities that have shaped the existing condition discussed and displayed in this document include: (1) 3,872 acres of harvest/regeneration treatments, (2) 373 acres of other harvests cutting and 382 acres of hazardous tree removal treatments, (3) 822 acres of pre-commercial thinning, and (4) 7,922 acres of fuels treatments from 1950 to present (table 10), although some of these treatments were on the same area and so the acreages are not accumulative. In addition to the management actions, vegetation has been shaped by (1) 87 acres in the Snow Talon Fire (2003), (2) 261 acres in the Keep Cool Fire (2006), and (3) insect and disease activity as discussed previously. Other past actions, such as livestock grazing and recreational activities have played a small role in shaping forest vegetation in the project area, or played a localized role. As mentioned above, these activities have been considered in describing the current condition.

Present Activities

Appendix C displays all of the past, ongoing and foreseeable projects identified by the HNF for possible consideration in this analysis. Activities that when combined with the proposed activities could contribute to cumulative effects were considered in this analysis. Some of the activities listed are not considered in this analysis because they are (1) outside of the analysis area used in this analysis, or (2) have no effect on the forest vegetation issue indicators addressed in this analysis, or (3) have such a small effect on the forest vegetation issue indicators used in this analysis that they are inconsequential to the analysis.

Effects Common to All Alternatives

The continuing effects on forest species composition and structures due to fire exclusion, succession, insect infestations, and diseases would be the same under all alternatives for areas not proposed for treatment in alternatives 2 and 3. In the short term, these changes would be slight but in the long term could be substantial. These effects would be the continuing decline in area within all biophysical settings in the earlier vegetation-fuel classes and an increase in the later vegetation-fuel class. In general terms, (1) overall stand structures would become more closed-canopy and multi-story, and (2) species compositions would become more dominated by climax, shade-tolerant tree species, which would largely be subalpine fir.

Insects and Diseases

Mountain Pine Beetle

In stands receiving no treatment, mountain pine beetle activity would continue to some degree, but as discussed above, we suspect that the recent mountain pine beetle epidemic in the project area has probably peaked would decline to endemic levels in the short term because the supply of host trees has been depleted. Mountain pine beetle risk would be lower than before the recent epidemic into the long-term because stands are moving successionally from dominance by lodgepole pine toward Douglas-fir and subalpine fir.

Douglas-fir Beetle

Douglas-fir beetle in the short term would continue at recent levels. In the long term, due to the increase in Douglas-fir stocking, tree size, and total stand stocking, Douglas-fir beetle populations can be expected to increase and an outbreak would most likely occur.

Western Spruce Budworm

In the short term WSB populations are likely to continue at current levels. In the long term, WSB populations can be expected to increase due to an increase in host species—Douglas-fir and subalpine fir-dominance on the landscape, and the increase in multiple-storied stand structures.

Dwarf Mistletoe

Dwarf mistletoes would continue in the short term at levels described above, and in the long term would increase in presence and degree of impact. Lodgepole pine dwarf mistletoe would continue to increase the impacts of lodgepole pine and would accelerate the decline of lodgepole pine as a stand component.

Armillaria

In the short term armillaria root disease pockets would generally remain as described above, growing slowly larger. In the long term, the disease would have greater impacts in stands and on the landscape due (1) to the increase in dominance by tree species such as subalpine fir, Engelmann spruce and Douglas-fir, which are less resistant than seral species such as ponderosa pine and lodgepole pine, and (2) due to increases in stand stocking leading to deceases in tree vigor and disease resistance.

Species of Interest

Ponderosa Pine

As mentioned above, ponderosa pine is a shade-intolerant seral species on habitat types found in the project area and over time would decline in presence and eventually disappear without disturbance. It is a relatively long-lived species and to the decline and disappearance would be a long-term process punctuated by rapid declines brought about by events such as the recent mountain pine beetle outbreak.

Quaking Aspen

Quaking aspen as a relatively short stature and very shade-intolerant seral species would continue to decline from its already small presence and without disturbance would almost disappear. Aspen stems are relatively short-lived but the decline and disappearance would continue into the long term.

Western Larch

As with ponderosa pine, western larch is a shade-intolerant but relatively long-lived seral species on habitat types found in the project area and in the long term would decline in presence and eventually disappear without disturbance.

Whitebark Pine

Whitebark pine is a shade-intolerant seral species on almost all habitat types found in the project area and over time would decline in presence and almost disappear without disturbance.

Effects Common to All Action Alternatives

Effects common to all action alternatives include the effects of different proposed treatment regimes, the differences between the action alternatives being largely the amount of treatment area and in several proposed treatment units, the proposed treatment regime. Treatments proposed in this project are described in eight treatment groups (USDA Forest Service 2010b):

Prescription Groups

Group 1 (Intermediate Harvest)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains Douglas-fir, lodgepole pine, and mixed-species forest types mostly on Douglas-fir and ponderosa pine-Douglas-fir BpS with small inclusions of shrubland and barren BpS. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (36%) and subalpine fir (59%) habitat types with minor amounts of unknown habitat types.

Treatment objectives for this group are to develop mature, open forests comprised mostly of fire-resistant species. The proposed treatments would thin live trees, remove dead trees, and prescribe burn surface fuels. All tree thinning would be "from below" to favor retaining larger trees over smaller trees except that thinning regimes would favor retaining smaller trees of a more desirable species over larger trees of a less desirable species, and would favor keeping smaller, healthier-and-disease-free trees over larger, diseased trees. In general, the species preference for retention would be aspen, western larch, ponderosa pine, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir in descending order. This general order of preference may be modified for individual stands to address management objectives such as retaining species diversity, site factors, and other stand-specific factors such as relative species presence as noted in individual stand/unit prescriptions. Although not showing as present in these units, whitebark and limber pine would be retained if found.

Trees would be thinned to an average spacing of 20 to 40 feet (109 to 27 TPA), but spacing could vary widely. Thinning would be by hand and/or machine.

All cut live and dead trees of merchantable size would be removed for utilization except those needed to meet other resource concerns (e.g., snag and downed large woody debris requirements).

Following thinning and removal, units would be underburned or jackpot burned to reduce fuels.

Figure 26 displays the post-treatment species composition and structure for Stand 42303130 which partially forms Unit 46. The stand area is within the ponderosa pine-Douglas-fir BpS and is currently mostly ELSC with a minor component of BMSC and a very minor component of AESP which is a former lightly-forested meadow that is filling in. The effects of the proposed treatment would be to reduce the subalpine fir, Engelmann spruce, lodgepole pine, and Douglas-fir component and retain the ponderosa pine component. Stocking would be reduced to 258 TPA and 77 BA. The stand would have an almost “flat” diameter distribution and would be open and almost single-story but would still be uneven-aged.

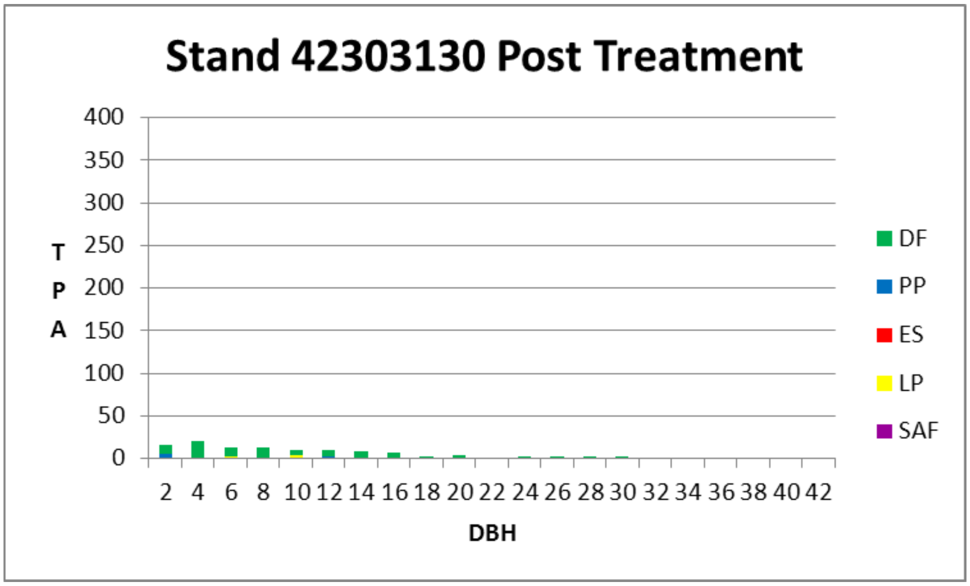

Figure 26. Stand 42303130 post thin and burn treatment

We displayed figure 26 above in the same vertical scale as figure 1 above for a direct comparison between the current and post-treatment condition. In figure 27 below we change the vertical scale to better display the species composition.

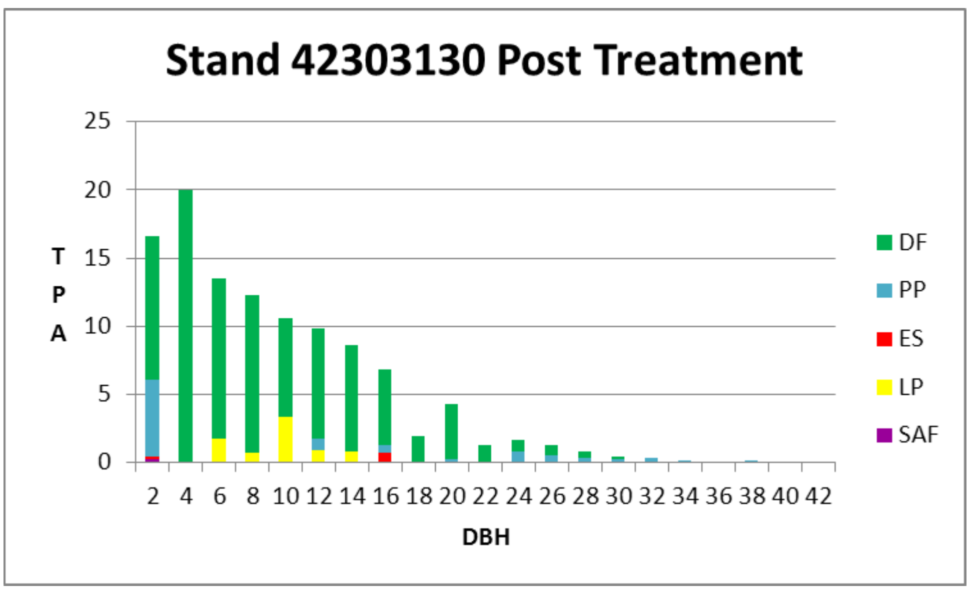

Figure 27. Stand 42303130 post thin and burn treatment

Other treatment units in this prescription group (appendices I and L) vary from that shown above somewhat in species composition and current structure, BpS, and vegetation-fuel classes. The general effects of the treatment would be as shown above; (1) diameter distributions would become much “flatter” and (2) shade-tolerant and fire-intolerant tree species would decline in representation and shade-intolerant and fire-tolerant tree species would increase in relative representation. In terms of vegetation-fuel classes, treatment effects would be to (1) move ELSC to DLSO, (2) retain DLSO, (3) retain CMSO, (4) move BMSC to CMSO, and (5) retain AESP.

Growth and vigor in the remaining trees would increase. Opening up the stand and prescribed burning can be expected to initiate a wave of tree establishment but the magnitude of the establishment would be moderated by overstory stocking. In the long-term, without additional treatments, the stand would again develop a dense understory and move back toward the current condition. Future treatments would be required to continue increasing ponderosa pine as a stand component and retain the open nature of the stands.

Group 2 (Precommercial Thinning)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10.This group contains Douglas-fir, lodgepole pine, and mixed-species forest types mostly on dry Douglas-fir, moist Douglas-fir, and ponderosa pine-Douglas-fir BpS with small inclusions of shrubland, shrubland-grassland, and barren BpS. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (50%) and subalpine fir (47%) habitat types with minor amounts of other habitat types.

This group consists of previous harvest/regeneration units that are proposed for precommercial thinning. Treatments would thin small diameter trees of little to no merchantable value. All tree thinning would be from below but would favor retaining smaller trees of a more desirable species over larger trees of a less desirable species, and would favor keeping smaller, healthier-and-disease-free trees over larger, diseased trees. In general, the species preference for retention would be aspen, western larch, ponderosa pine, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir in descending order. Post-thinning average tree spacing would range from 12 to 20 feet (109 to 303 TPA). Thinning would be by hand and/or machine, depending upon tree size. In several units, thinning slash would be piled by hand and burned. Figure 28 displays an example plantation from the Stonewall area after thinning.

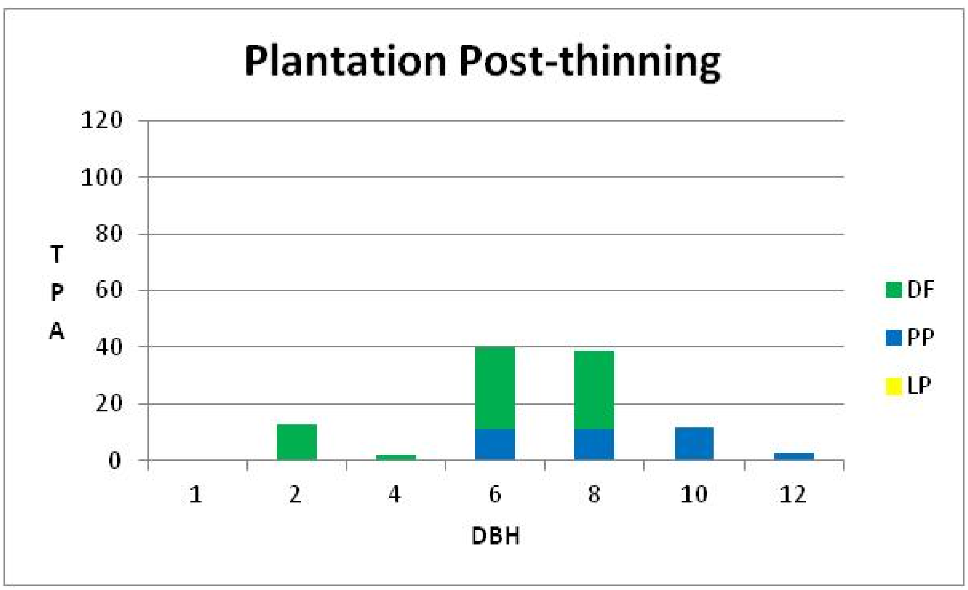

Figure 28. Plantation post-thinning diameter distribution

Following treatment, the stands would be more uniformly-sized because the smaller, slower-growing trees have mostly been removed. All of the stands would be more open and classified as CMSO. Growth and vigor would increase. In the long-term, trees would grow larger and canopy cover would increase, transitioning the stands into DLSO or ELSC depending upon the amount of canopy cover at the time the trees area greater than greater than nine inches d.b.h.

Group 3 (Seedtree and Shelterwood Harvest/Regeneration)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains lodgepole pine and mixed-species forest types mostly on dry Douglas-fir and ponderosa pine-Douglas-fir BpS with small inclusions of shrubland, shrubland-grassland, and barren BpS. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (41%) and subalpine fir (47%) habitat types with minor amounts of other habitat types.

This group includes stands that have been severely impacted by the recent bark beetle outbreak but which do contain overstory trees that can be retained as seed sources and as shelter for seedlings. Treatments proposed are seedtree and shelterwood harvest/regeneration systems. Most trees, except as needed for shelter and seed production would be removed. In some of the shelterwoods, trees would be retained in groups; in others, the remaining trees would be relatively evenly distributed. All cut live and dead trees of merchantable size would be removed for utilization except those needed to meet other resource concerns (e.g., snag and downed large woody debris requirements). Many of the units would be burned to reduce fuel loads and prepare sites for natural regeneration or planting. Many of the units may be planted with some combination of ponderosa pine, Douglas-fir, and western larch where needed to regenerate the stands to the desired seral and fire-resistant species.

Figure 20 shows an example stand in the Stonewall Project area that is proposed for a shelterwood treatment. The diameter distribution displays the current condition including dead trees. Most of the lodgepole pine in the stand was killed except for the very small trees and a few between six and 10 inches d.b.h. Figure 29 shows the stand immediately following a shelterwood treatment. Other stands in this group would vary in the species, remaining numbers of trees retained, and the distribution of the remaining trees but the general characteristics of the treatment, that is, a very open stand with a residual single-layer overstory would be the same.

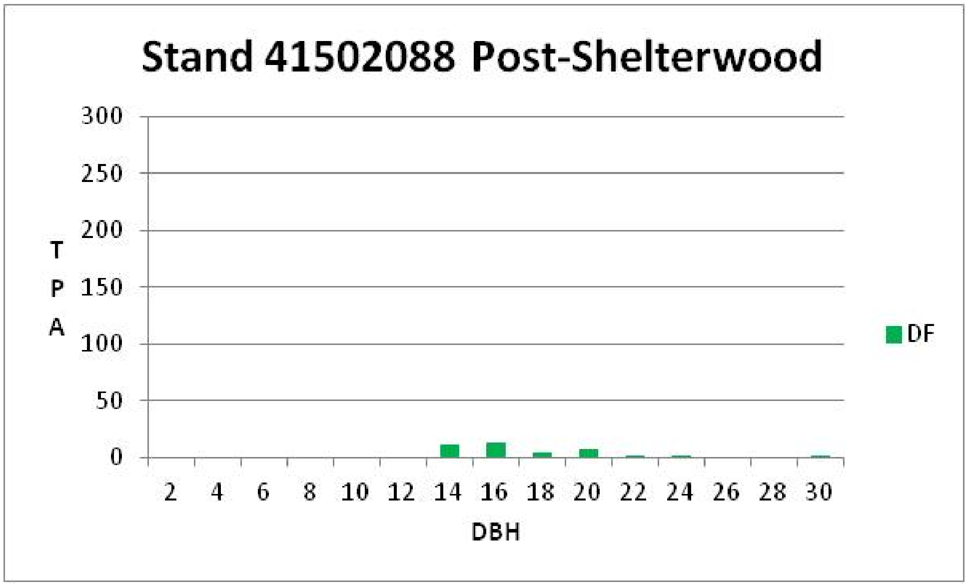

Figure 29. Stand 41502088 post-shelterwood

Following treatment, all of the stands would be classified as AESP. In the long-term, the stands would regenerate and transition out of AESP into CMSO. Many of the stands would develop in a two-story structure depending upon the number of seed and shelter trees retained.

Group 4 (Clearcut Harvest/Regeneration)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains the lodgepole pine forest type mostly on dry Douglas-fir, moist Douglas-fir and ponderosa pine-Douglas-fir BpS with small inclusions of mountain grassland with shrubs. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (21%) and subalpine fir (75%) habitat types with minor area of other habitat types.

This group includes stands that have been severely impacted by the recent bark beetle outbreak. Treatments proposed are clearcut harvest/regeneration systems in which all trees would be removed except for scattered clumps or individuals. Retained trees would mostly be Douglas-fir, ponderosa pine, or western larch. All live and dead merchantable trees would be removed for utilization except those needed to meet other resource concerns. Following cutting and removal, units would be prescribed burned, the type of burn varying by individual unit fuels reduction and site preparation needs. Natural regeneration by Douglas-fir and lodgepole pine is expected to occur to some degree, and Douglas-fir, ponderosa pine, and western larch may be planted to achieve the desired species composition, the mixture differing by individual unit based upon site attributes.

Since this treatment is a “clearcut with reserves” there would be a very open distributed to clumpy overstory remaining following the treatment. Each unit’s tree distributions would vary to some degree in species, number of retained trees, and distribution, but general characteristics of the treatment, that is, a very open stand with a patches and individual trees scattered throughout would be the same.

Following treatment, all of the stands would be classified as AESP. In the long term, the stands would regenerate and transition out of AESP into CMSO. Many of the stands would develop in a two-story structure depending upon the number of seed and shelter trees retained.

Group 5 (Remove dead and dying trees, slash noncommercial-sized trees)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains the mixed-species forest type on ponderosa pine-Douglas-fir BpS. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (60%) and subalpine fir (30%) habitat types. This group includes two treatment units (4 and 5) comprising about 25 acres. The treatments would remove dead and dying trees, slash noncommercial-sized trees, and reduce fuels by handpiling and burning. Post-thinning the units would have from 194 to 435 TPA (10-15 foot average spacing). All cut merchantable trees would be removed for utilization using ground-based equipment except as needed to meet other resource concerns. Figure 30 displays the post-thinning diameter distribution for Stand 415020066 in Unit 4. Unit 5 differs somewhat from Unit 4 in species composition, but the general effects of reducing the small tree stocking would be the same.

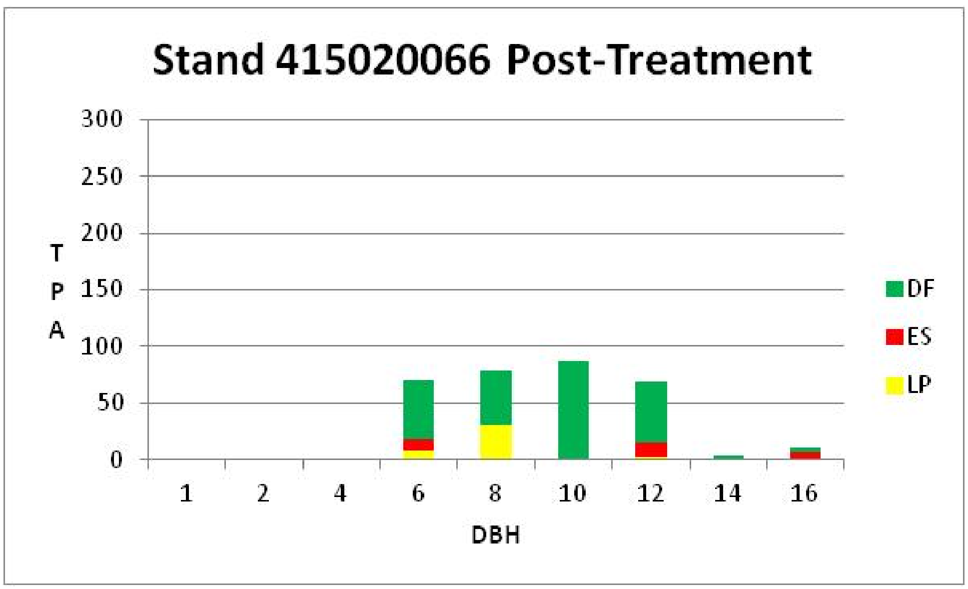

Figure 30. Stand 41020066 post-treatment

In terms of vegetation-fuel classes, the units would be moved to CMSO from DLSO or from ELSC to DLSO depending upon the pre-treatment class.

Group 6 (Low-intensity prescribed burning with 5-10 acre mortality patches)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains the Douglas-fir forest type on dry Douglas-fir, moist Douglas-fir and ponderosa pine-Douglas-fir. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (61 percent) and subalpine fir (38 percent) habitat types with minor area of a spruce habitat type.

This group includes three treatment units comprising about 449 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. The prescribed burning would create openings less than 5 acres or in some cases up to10 acres, the opening size depending upon the unit. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration.

Figure 14 shows the current condition for Stand 41502089 which forms a part of proposed treatment Unit 2. Note that we did not display present dead trees to keep the chart simple. Figure 31 shows the stand immediately following a modeled low-intensity fire. The modeled fire would kill most of the small trees but few of the large trees. The modeled fire would kill only two TPA greater than 17 inches d.b.h. Immediately following the treatment the stand would have about 92 TPA, 88 square feet BA, and 17 TPA greater than 17 inches d.b.h. The quaking aspen is shown as being killed but tree regeneration by sprouting or seed was not being modeled in the exercise. Following the treatment the aspen can be expected to resprout and conifers to become established in the understory.

In the short term we can expect the stands in this group to be complexes of all five vegetation-fuel classes including about 15 percent of early-seral. The diameter distribution shown in Figure 31 is a “stand average” and does not display the high degree of variability within the post-treatment units within this group. In the long-term, natural regeneration through sprouting and conifer seeds, would form a new cohort in the understory. The new understory would also be very variable in the numbers of trees, with many young trees in the small openings, and few under the dense overstory groups. A mixture of species would become established, but conditions would favor seral species.

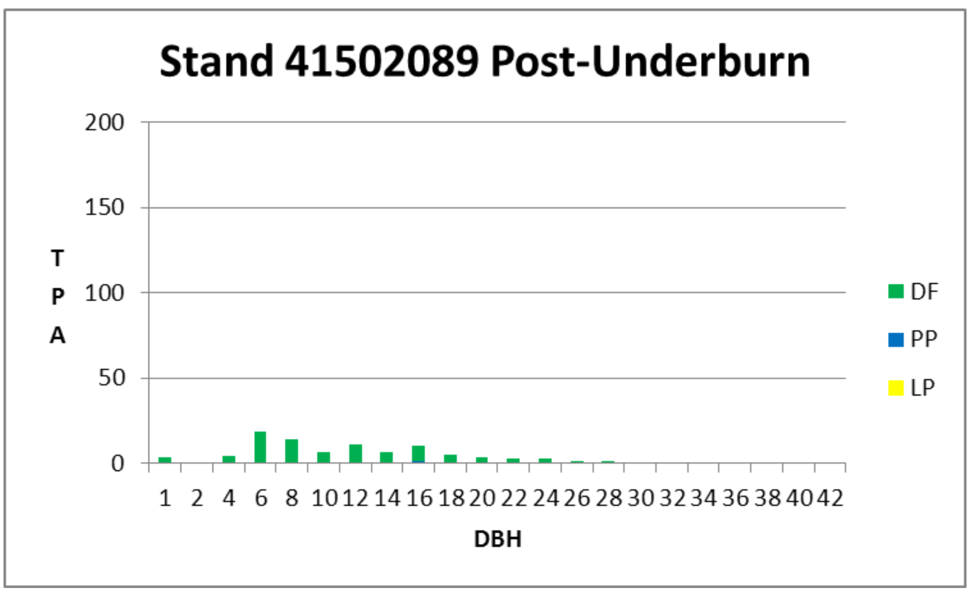

Figure 31. Stand 41502089 post-underburn treatment

Group 7 (Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains the Douglas-fir and lodgepole pine forest types on dry Douglas-fir and ponderosa pine-Douglas-fir BpS. Detailed information about the habitat types found within units in this prescription group can be found in table 11. This prescription group is dominated by Douglas-fir (91 percent) and subalpine fir (9 percent) habitat types.

This group includes three treatment units comprising about 410 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. Where the opportunity exists, small trees would be cut to create small openings around available whitebark pine, ponderosa pine, western larch, and Douglas-fir trees to enhance the regeneration of those species. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration. The treatments would create patches of mortality up to 5, 10, or 20 acres depending upon the treatment unit (appendices K and L).

The general effects of these treatments would be similar to those in Group 6 but would be more variable with some larger patches of mortality. The cutting and burning would kill most of the small trees but few of the large trees. A mosaic of tree diameter distributions reflected in figures 2, 4-11, and 13-17 would be found within the treatment units due to the variable nature of the treatment.

Following the treatment the aspen can be expected to resprout and conifers to become established in the understory especially in the small patches of mortality and small, deliberately created openings. A number of species would become established, but conditions would favor the establishment of seral species.

In the short term we can expect the stands in this group to be highly-variable complexes of all five vegetation fuel classes including about 15 percent of early-seral. In the long term, natural regeneration through sprouting and conifer seeds would form a new cohort in the understory. The new understory would also be very variable in the numbers of trees, with many young trees in the small openings, and few under the dense overstory groups.

Group 8 (Mixed-severity prescribed burning with 30-75 acre mortality patches)

Detailed information concerning biophysical settings found in each treatment unit can be found in table 12. Detailed information concerning the biophysical settings found within this treatment group, and the proportion of the treatment group within the BpS can be found in table 13. Detailed information concerning the forest type and species composition of individual units within this group can be found in table 10. This group contains the Douglas-fir and lodgepole pine forest types on dry Douglas-fir, moist Douglas-fir, ponderosa pine-Douglas-fir and interior west lower subalpine BpS. Detailed information about the habitat types found within units in this prescription group can be found in table 11 This prescription group is dominated by Douglas-fir (23 percent) and subalpine fir (67 percent) habitat types with inclusions of rock and grass.

This group includes seven treatment units comprising about 4,604 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. Where the opportunity exists, small trees would be cut to create small openings around available whitebark pine, ponderosa pine, western larch, and Douglas-fir trees to enhance the regeneration of those species. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration. The treatments would create patches of mortality up to 30 or 75 acres depending upon the treatment unit (appendix B).

The general effects of these treatments would be similar to those in Group 7 but would have larger patches of mortality. The cutting and burning would kill most of the small trees but few of the large trees in areas, but due to the variable nature of the burning, patches of dense small trees can be expected to survive the fire. As with group 7, a mosaic of tree diameter distributions would be found within the treatment units due to the variable nature of the treatment.

Following the treatment the aspen can be expected to resprout and conifers to become established in the understory especially in the patches of mortality and deliberately created openings. A number of species would become established, but conditions would favor the establishment of seral species.

In the short term we can expect the stands in this group to be highly-variable complexes of all five vegetation-fuel classes including about 15 percent of early-seral. In the long term, natural regeneration through sprouting and conifer seeds would form a patchy new cohort in the stands.

Alternative 1 – No-Action

Direct and Indirect Effects

There would be no direct effects to vegetation under this alternative. Stand structures, stocking levels, species compositions, and susceptibility to diseases and insects would not change from that described above in the existing condition.

Biophysical Settings and Vegetation-fuel Classes

As succession continues, trees grow, understories fill in, and coverage increases, the proportion of vegetation-fuel class area in each BpS would continue to shift. The current condition displayed in table 14 is the result of those processes upon the reference condition and it can be expected that the direction of change reflected in table 14 would continue. Table 14 displays the relative current amount (Cur) and expected direction of future change (Dir) for each BpS/Vegetation-fuel class combination. With no action, we can expect the current condition to progress farther from the reference and desired condition.

Table 14. Alternative 1 BpS and vegetation-fuel class current and future direction of change

	AESP	BMSC	CMSO	DLSO	ELSC
BpS	**Cur/ Dir**	**Cur/ Dir**	**Cur/ Dir**	**Cur/ Dir**	**Cur/ Dir**
Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	VL/D	H/D	L/D	L/D	VH/I
Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	VL/D	H/D	L/D	L/D	VH/I
Ponderosa Pine-Douglas-fir	VL/D	VH/D	N/N	VL/D	VH/I
Interior West Lower Subalpine Forest	VL/D	L/D	L/D	VH/I	VH/I
Interior West Upper Subalpine Forest	N/N	L/D	L/D	H/I	VH/I

D – Declining
H – High (Yellow, Greater than desired but less than 180 percent of desired)
I – Increasing
L – Low (Orange, Greater than or equal to 20 percent but less than desired)
N – None
VH – Very High (Green, Greater than or equal to 180 percent of desired)
VL – Very Low (Red, none to less than 20 percent of desired)

Stand Structures and Species Compositions

General indirect effects on species compositions would be, in the short term and long term, stands continue to progress successionally with continuing decreases in seral species and increases in climax species (Fischer and Clayton 1983, Fischer and Bradley 1987). Species compositions on the subalpine fir habitat types would continue to change as the seral species–ponderosa pine, lodgepole pine, whitebark pine, aspen, Douglas-fir, and Engelmann spruce–die out of the stands due to insect or competition-related mortality, to be replaced by subalpine fir. Species compositions on the Douglas-fir habitat types would similarly change with species composition shifting toward Douglas-fir. Succession can be a relatively slow process, punctuated by abrupt shifts such as that caused by the recent bark beetle mortality, which reduced the seral overstory and mid-story components in many stands. The changes that have taken place within the last few years due to the recent mountain pine beetle epidemic are substantial. In the short term, any further change would be relatively small and easily reversible, but in the long term, the change would be profound and difficult to reverse due to the absence of seral tree species present to provide seed for natural regeneration.

Along with the species composition shifts, shade-tolerant trees would increase and fill in lesser-stocked areas, including those created by the recent bark beetle mortality and natural openings (Copenheaver et al. 2009, Skinner 1995), making individual stands and the landscape more homogeneous and less structurally diverse.

Insects and Diseases

In this alternative, no actions would be taken. The effects described above for untreated stands under all alternatives would apply to stands in this alternative.

Species of Interest

Ponderosa Pine

As discussed above, with no action, ponderosa pine would decline in presence due to succession under this alternative and in the long-term would almost disappear from the landscape.

Quaking Aspen

As discussed above, with no action, quaking aspen, already a very minor component on the landscape would decline in presence due to succession under this alternative and in the long-term would almost disappear.

Western Larch

As discussed above, with no action, western larch, already a very minor component on the landscape would decline in presence due to succession under this alternative and in the long-term would almost disappear.

Whitebark Pine

As discussed above, with no action, whitebark pine, which has declined as a landscape component due to insects and diseases (volume 2, appendix B), would decline in presence due to succession under this alternative and in the long term, would almost disappear. On a very small portion of the landscape, on the highest elevation ridges, it may continue to survive as a component with subalpine fir.

Cumulative Effects

As mentioned above, all past activities are taken into account in this analysis in the current condition description and do not again need to be discussed in cumulative effects. Hence, cumulative effects in this analysis are the effects of the alternative being discussed, present, and foreseeable actions. Three ongoing activities: the Forestwide hazardous tree removal and fuels reduction HFRA project, continuing livestock grazing permits, and noxious weed treatments have the potential to affect forest vegetation.

Biophysical Settings and Vegetation-fuel Classes

Because of the very minor effects on forest vegetation from removing hazardous trees along roadsides, grazing livestock, and noxious weed treatments, cumulative effects for this alternative would be the same as direct and indirect effects discussed above.

Insects and Diseases

The current and ongoing activities would have no discernible effect on insect and disease levels in the project area. The insect and disease levels and risk would continue as described above for the direct and indirect effects.

Species of Interest

Ponderosa Pine, Western Larch, Whitebark Pine

Because of the very minor effects on stand species compositions from removing hazardous trees along roadsides, grazing livestock, and noxious weed treatments, cumulative effects for this alternative would be the same as direct and indirect effects discussed above.

Quaking Aspen

Removing hazardous trees along roadsides and noxious weed treatments would have very minor effects on this species. Continuing livestock grazing may have a localized impact on individual aspen clones within the grazing allotments ability to successfully regenerate through suckering. However, the effect of the grazing would be very minor because as discussed above, the condition of the aspen is what can be characterized as: a minor component in poor and declining condition due to competition with conifers.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

More information about compliance with standards and direction from the Forest Plan is in appendix B. Compliance of alternative 1 (no action) with Forest Plan forestwide standards pertinent to this vegetation discussion are displayed in volume 2, appendix B, table B-4. Compliance with management area standards is displayed in table B-5, and compliance with Forest Plan direction for regeneration harvest is displayed in table B-6.

Alternative 2 – Proposed Action

About 8,564 acres of treatment is proposed under this alternative. This is about 36 percent of the project area. The proposed treatments for each prescription group are shown in table 15 and figure 32. Total treatment acres for each prescription group are displayed in table 16. Treatment effects for each group are the same for alternatives 2 and 3 and are described in the Effects Common to All Action Alternatives section.

Table 15. Alternative 2 proposed treatments by prescription group and unit

Group	Unit	Treatment Type	Prescription	Regeneration	Acres
1	6	Intermediate Harvest	Improvement Cut, Underburn	N/A	14
1	7	Intermediate Harvest	Improvement Cut, Underburn	N/A	17
1	8	Intermediate Harvest	Improvement Cut, Underburn	N/A	62
1	15	Intermediate Harvest	Improvement Cut, Underburn	N/A	15
1	23	Intermediate Harvest	Improvement Cut, Underburn	N/A	29
1	24	Intermediate Harvest	Improvement Cut, Underburn	N/A	5
1	26	Intermediate Harvest	Improvement Cut, Underburn	N/A	65
1	28	Intermediate Harvest	Improvement Cut, Underburn	N/A	22
1	30	Intermediate Harvest	Improvement Cut, Underburn	N/A	14
1	31	Intermediate Harvest	Improvement Cut, Underburn	N/A	16
1	32	Intermediate Harvest	Improvement Cut, Underburn	N/A	45
1	33	Intermediate Harvest	Improvement Cut, Jackpot Burn	N/A	17
1	44	Intermediate Harvest	Improvement Cut, Underburn	N/A	97
1	45	Intermediate Harvest	Improvement Cut, Underburn	N/A	38
1	46	Intermediate Harvest	Improvement Cut, Jackpot Burn	N/A	251
1	47	Intermediate Harvest	Improvement Cut, Jackpot Burn	N/A	220
1	54	Intermediate Harvest	Improvement Cut, Jackpot Burn	N/A	20
1	55	Intermediate Harvest	Improvement Cut, Underburn	N/A	29
2	3	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	37
2	14	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	11
2	16	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	3
2	18	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	21
2	21	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	6
2	48	Intermediate Harvest	Precommercial Thin	N/A	141
2	49	Intermediate Harvest	Precommercial Thin	N/A	49
2	50	Intermediate Harvest	Precommercial Thin	N/A	49
2	51	Intermediate Harvest	Precommercial Thin	N/A	193
2	59	Intermediate Harvest	Precommercial Thin	N/A	16
2	60	Intermediate Harvest	Precommercial Thin	N/A	25

Group	Unit	Treatment Type	Prescription	Regeneration	Acres
2	61	Intermediate Harvest	Precommercial Thin	N/A	34
2	62	Intermediate Harvest	Precommercial Thin	N/A	37
2	63	Intermediate Harvest	Precommercial Thin	N/A	17
2	64	Intermediate Harvest	Precommercial Thin	N/A	30
2	65	Intermediate Harvest	Precommercial Thin	N/A	25
2	66	Intermediate Harvest	Precommercial Thin	N/A	26
2	67	Intermediate Harvest	Precommercial Thin	N/A	20
2	68	Intermediate Harvest	Precommercial Thin	N/A	15
2	69	Intermediate Harvest	Precommercial Thin	N/A	31
2	70	Intermediate Harvest	Precommercial Thin	N/A	39
2	71	Intermediate Harvest	Precommercial Thin	N/A	40
2	72	Intermediate Harvest	Precommercial Thin	N/A	85
2	73	Intermediate Harvest	Precommercial Thin	N/A	33
2	75	Intermediate Harvest	Precommercial Thin	N/A	148
3	1	Regeneration Harvest	Shelterwood (Group) with Reserves, Site Prep Burn	NRG DF/LP, Plant PP/WL	96
3	9	Regeneration Harvest	Seedtree with Reserves, Slashing, Handpiling, Burn Piles	NRG DF/LP	18
3	11	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP/ES/AS, Plant PP	23
3	12	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP/ES/AS, Plant PP	80
3	13	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	NRG DF/LP/AS	41
3	20	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	To Be Determined*	32
3	22	Regeneration Harvest	Shelterwood with Reserves, Site Prep Burn	NRG DF/LP	30
3	25	Regeneration Harvest	Seedtree with Reserves, Broadcast Burn	NRG DF/LP, Plant PP/WL	29
3	29	Regeneration Harvest	Shelterwood (Group) with Reserves, Slashing, Handpile/Burn	NRG LP/DF	25
3	34	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant DF/WL	12
3	39	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	NRG LP/DF, Plant DF/PP	42
3	40	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	NRG LP/DF, Plant DF/PP	11
3	41	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG LP/DF, Plant DF/PP	12
3	42	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	NRG LP/DF, Plant DF/PP	65
3	43	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	NRG LP/DF, Plant DF/PP	104
3	53	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant DF/WL	17

Group	Unit	Treatment Type	Prescription	Regeneration	Acres
3	57	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant PP	93
3	58	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant PP	15
4	10	Regeneration Harvest	Clearcut with Reserves, Jackpot Burn	NRG DF/LP, Plant PP	18
4	17	Regeneration Harvest	Clearcut with Reserves, Jackpot Burn	NRG LP/DF, Plant PP	38
4	19	Regeneration Harvest	Clearcut with Reserves, Jackpot Burn	To Be Determined*	15
4	27	Regeneration Harvest	Clearcut with Reserves, Site Prep Burn	NRG LP/DF, Plant DF/PP/WL	31
4	35	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	24
4	36	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF	20
4	37	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	8
4	38	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	7
4	52	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	22
4	56	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	17
4	74	Regeneration Harvest	Clearcut with Reserves, Site Prep Burn	NRG, plant	23
5	4	Intermediate Harvest	Sanitation, Slashing, Handpiling, Burn Piles	N/A	7
5	5	Intermediate Harvest	Sanitation, Slashing, Handpiling, Burn Piles	N/A	18
6	2	Prescribed Fire	Low Severity Fire, Openings <5 Acres	NRG PP/DF	146
6	76	Prescribed Fire	Low Severity Fire, Openings <10 acres	NRG DF/LP/WB	123
6	78	Prescribed Fire	Low Severity Fire, Openings <5 acres	NRG DF/LP/PP	38
6	85	Prescribed Fire	Low Severity Fire, Openings <5 acres	Natural Recovery	143
7	80	Prescribed Fire	Mixed Severity Fire, Openings <20 acres	Natural Recovery	326
7	86	Prescribed Fire	Mixed Severity Fire, Openings <10 acres	Natural Recovery	47
7	87	Prescribed Fire	Mixed Severity Fire, Openings <5 acres	NRG LP/DF/AS	36
8	77	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	NRG LP/DF	736
8	79	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	NRG LP/DF/PP/WB	337
8	81	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	Natural Recovery	629
8	82	Prescribed Fire	Mixed Severity Fire, Openings <75 acres	Natural Recovery	776
8	83	Prescribed Fire	Mixed Severity Fire, Openings <75 acres	Natural Recovery	457
8	84	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	Natural Recovery	831
8	88	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	Natural Recovery	892

Table 16. Alternative 2 total treatment acres by prescription group

Group	Alternative 2 Acres
1	974
2	1,132
3	745
4	223
5	25
6	449
7	410
8	4,604
Totals	**8,564**

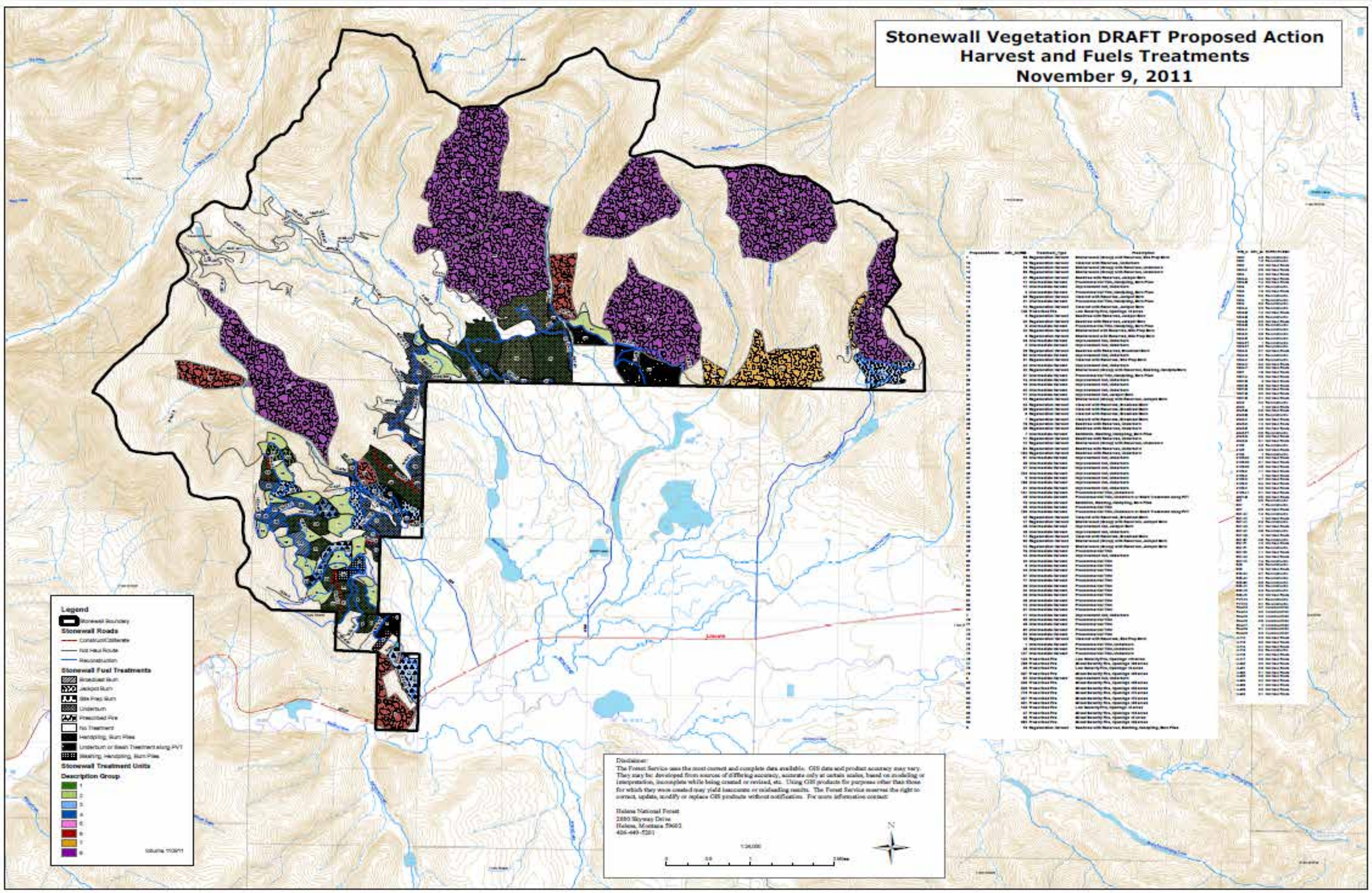

Figure 32. Alternative 2 (proposed action) harvest and fuels treatments

Design Features and Mitigation Measures

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described above for the treatment groups, design features would be implemented where applicable. A description of the project design features relating to silviculture and other resources is displayed in table 9, chapter 2.

The design features in table 9 pertaining to silviculture are: SILV-1, SILV-2, SILV-3, and SILV-4. This analysis is based on the implementation of all design features. Specific design features listed above that are applicable to vegetation include not only those designed specifically to protect vegetation, but also those designed to protect other resources such as water and soil.

Biophysical Settings and Vegetation-fuel Classes

Proposed treatments would change vegetation-fuel classes in the project area as described above. Table 17 displays our projected vegetative-fuel class matrix for each BpS under Alternative 2 (A2), the Current vegetation-fuel class matrix (Cur), and the desired (Ref) vegetation-fuel class matrix for the project area as discussed above. Table cells that are colored red or orange BpS/vegetation-fuel class combinations that are under-represented on the landscape, those that are colored green and yellow are over-represented, and no color in close to that desired. All but the CLSO, BMSC, and DLSO vegetation-fuel class for the upper subalpine fir BpS, the BMSC and DLSO vegetation-fuel classes for the lower subalpine BpS, and the DLSO vegetation-fuel class for the moist Douglas-fir BpS would move toward the desired levels. Four of the vegetation-fuel class/BpS combinations are within 20 percent of the desired condition and we consider them “close” to the desired. Note that because (1) the current condition may not fully reflect changes in vegetation-fuel classes due to the recent mountain pine beetle activity, and (2) changes in vegetation-fuel classes due to proposed treatments are modeled estimates, one must not take the current and Alternative 2 as precise values. The most important factors considered in this analysis are the direction and magnitude of vegetation-fuel class change due to the treatments and the relationship between the reference condition and the Alternative 2 direction and magnitude of change.

Table 17. Alternative 2 post-treatment, current and desired vegetation-fuel classes by BpS

BpS	AESP A2/ Cur/ Ref	BMSC A2/ Cur/ Ref	CMSO A2/ Cur/ Ref	DLSO A2/ Cur/ Ref	ELSC A2/ Cur/ Ref
Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	7/ 2/ 15	21/ 31/ 25	12/ 4/ 20	19/ 8/ 25	41/ 55/ 15
Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	6/ 1/ 15	22/ 35/ 25	14/ 5/ 20	18/ 10/ 25	39/ 50/ 15
Ponderosa Pine-Douglas-fir	14/ 1/ 15	16/ 31/ 10	11/ 0/ 25	24/ 1/ 40	35/ 67/ 10
Interior West Lower Subalpine Forest	5/ 1/ 20	15/ 21/ 40	12/ 7/ 10	32/ 25/ 5	37/ 46/ 25
Interior West Upper Subalpine Forest	3/ 0/ 20	21/ 22/ 25	11/ 11/ 25	27/ 22/ 15	38/ 46/ 15

Yellow – High (Greater than desired but less than 180 percent of desired)

Orange – Low (Greater than or equal to 20 percent but less than desired)
No Color – Within 20% of desired
Green – Very High (Greater than or equal to 180 percent of desired)
Red – Very Low (less than 20 percent of desired)

Species of Interest

Ponderosa Pine

The effects of this alternative would be to increase the presence of ponderosa pine as a stand component in treated stands, with the degree of increase varying depending upon the type of treatment and the individual stand. Depending upon the treatment and unit, ponderosa pine would increase due to (1) retaining PP over less preferred species during thinning increasing PP as a portion of future stand stocking relative to less preferred species, (2) increased natural establishment of PP, and (3) planting PP. The degree of PP increase is displayed in table 18. Ponderosa pine would increase to some degree on about 23 percent of the project area.

Table 18. Alternative 2 effects of treatment groups on ponderosa pine

Treatment	Degree Of Pp Increase	Acres
Group 1 –Intermediate Harvest	Increase in presence relative to less preferred species during thinning tree selection to long-term small increase in number of trees due to increased establishment in more open stands	845
Group 2 –Pre-commercial thin	Increase in presence relative to less preferred species, no increase in number of trees. Note that in some units PP is not currently present.	651
Group 3 - Seedtree and shelterwood harvest/regeneration	Substantial short and long-term increase due to planting and natural regeneration	633
Group 4 – Clearcut harvest/regeneration	Substantial short and long-term increase due to planting and natural regeneration	102
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	Increase in presence relative to less preferred species during thinning tree selection, small due to current “trace” presence	25
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	Increase in presence relative to other species due to higher ponderosa pine fire-tolerance and in tree numbers due to PP establishment in open areas	326
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	Increase in presence relative to other species due to higher ponderosa pine fire-tolerance and in tree numbers due to PP establishment in open areas	374
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	Increase in presence relative to other species due to higher ponderosa pine fire-tolerance and in tree numbers due to PP establishment in open areas	2,506

Quaking Aspen

The effects of this alternative would be to increase the presence of quaking aspen (AS) as a stand component where it is found in treated stands, with the degree of increase varying depending upon the type of treatment and the individual stand. Quaking aspen would increase due to (1) retaining aspen over less preferred species during thinning increasing its relative presence as a portion of future stand stocking, and (2) increased suckering of aspen due to increased growing space. Quaking aspen would increase to some degree on about 10 percent of the landscape.

Table 19. Alternative 2 effects of treatment groups on quaking aspen

Treatment	Degree Of As Increase	Acres
Group 1 –Intermediate Harvest	Increase in presence relative to less preferred species during thinning tree selection and increase in suckering, may be some top-killing of aspen during burning	547
Group 2 –Pre-commercial thin	Increase in presence relative to less preferred species during thinning tree selection and increase in suckering	402
Group 3 - Seedtree and shelterwood harvest/regeneration	Increase in suckering, may be some top-killing of aspen during burning	410
Group 4 – Clearcut harvest/regeneration	Increase in suckering, may be some top-killing of aspen during burning	15
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	Increase in presence relative to less preferred species during thinning tree selection, may be a small increase in suckering	25
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	May be some top-killing of existing stems, increased suckering due to increases in growing space	146
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	May be some top-killing of existing stems, increased suckering due to increases in growing space	410
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	May be some top-killing of existing stems, increased suckering due to increases in growing space	337

Western Larch

The effects of this alternative would be to increase the presence of western larch (WL) as a stand component with the degree of increase varying depending upon the type of treatment and the individual stand. Western larch would increase due to (1) retaining larch over less preferred species during thinning increasing its relative presence as a portion of future stand stocking, (2) planting larch in regeneration units, and (3) natural regeneration in regeneration units. Western larch would increase to some degree on about 3 percent of the project area.

Table 20. Alternative 2 effects of treatment groups on western larch

Treatment	Degree of WL Increase	Acres
Group 1 –Intermediate Harvest	Increase in presence relative to less preferred species during thinning tree selection, mostly small due to trace current stocking of WL	5
Group 2 –Pre-commercial thin	Increase in presence relative to less preferred species during thinning tree selection, mostly small due to small current stocking of WL	303
Group 3 - Seedtree and shelterwood harvest/regeneration	Substantial increase in numbers due to planting	184
Group 4 – Clearcut harvest/regeneration	Substantial increase in numbers due to planting	146
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	No increase expected due to lack of presence	0
Group 6 – Low-intensity	No increase expected due to lack of presence	0

Treatment	Degree of WL Increase	Acres
prescribed burning with 5-10 acre mortality patches		
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	No increase expected due to lack of presence	0
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	No increase expected due to lack of presence	0

Whitebark Pine

The effects of this alternative would be to increase the presence of whitebark pine (WB) as a stand component where it is found in treated stands, with the degree of increase varying depending upon the type of treatment and the individual stand (table 21). Whitebark pine would increase due to (1) retaining WB over less preferred species during thinning increasing its relative presence as a portion of future stand stocking, (2) natural regeneration in burning units. Whitebark pine would increase to some degree on about 17 percent of the project area.

Table 21. Alternative 2 effects of treatment groups on whitebark pine

Treatment	Degree Of Wb Increase	Acres
Group 1 –Intermediate Harvest	No increase expected due to lack of presence	NA
Group 2 –Pre-commercial thin	No increase expected due to lack of presence	NA
Group 3 - Seedtree and shelterwood harvest/regeneration	No increase expected due to lack of presence	NA
Group 4 – Clearcut harvest/regeneration	No increase expected due to lack of presence	NA
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	No increase expected due to lack of presence	NA
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	Increase in presence due to establishment in open areas	123
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	Possible small increase in presence expected due to establishment in open areas of limited suitable habitat types only	Trace
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	Increase in presence due to establishment in open areas	3,894

Insects and Diseases

Mountain Pine Beetle

Reducing tree stocking through thinning has been shown to reduce mountain pine beetle risk (appendix B). As discussed above, the recent mountain pine beetle epidemic has generally reduced the risk for a mountain pine beetle outbreak in most stands and over the landscape. The risk for a landscape-level MPB outbreak would be low into the long-term. There are, however stands containing live lodgepole, whitebark, or ponderosa pine trees in which stocking would be reduced under this project. In these treatment units (table 15), growth and vigor in the post-treatment pines would increase and MPB risk to the individual trees or small groups of trees would be reduced into the long-term. The total proposed unit area in which any of these tree species can be found is 8,564 acres although it must be noted that they are a minor component in many units and have been reduced in presence by the recent outbreak.

Douglas-fir Beetle

Douglas-fir beetle (DFB) activity is also positively related to tree stocking. Thinning and prescribed burning activities would reduce the risk of losing additional large Douglas-fir in treated stands into the long-term. The total proposed unit area in which Douglas-fir can be found is 7,172 acres although it must be noted that Douglas-fir is a minor component in some units. Outside of the treatment units DFB activity would continue as discussed above for untreated stands.

Fires can increase the susceptibility of Douglas-fir to bark beetle attack by scorching tree crowns, basal cambium, and root systems, (appendix B). Wildfires, because of the conditions under which they burn and the damage to Douglas-fir they can cause, can substantially increase DFB mortality in the years following the fires. However, because prescribed burns are implemented under less severe fire weather and fuel moisture conditions than wildfires usually burn, they damage residual Douglas-fir less and so result in lower potential for DFB to increase (appendix B). In this alternative, about 7,172 acres containing large Douglas-fir would be prescribe burned, resulting in a relatively small increase in Douglas-fir beetle risk to individual large Douglas-fir and a very small increase in risk to Douglas-fir over the landscape. The increase in risk would be short term.

Western Spruce Budworm

As discussed above, western spruce budworm’s primary hosts are Douglas-fir, Engelmann spruce, and true firs with multi-story, dense stands especially prone to developing high levels of WSB and susceptible to WSB damage. All treatments proposed in this alternative would reduce Douglas-fir, Engelmann spruce, and subalpine fir and so the predisposition of stands to be impacted by WSB on about 7,257 acres. These effects would continue into the long-term. On the remaining untreated area, WSB populations would continue as described above.

White Pine Blister Rust

The presence of white pine blister rust would not be reduced by the treatments because the treatments would attempt to minimize mortality to whitebark pine and would not attempt to directly reduce white pine blister rust infected trees. In a number of the prescribed burn units (chapter 2, table 9, Silv-2) small openings would be created to increase the regeneration of whitebark pine. Due to the past and current levels and impact of white pine blister rust on mature whitebark pine, cone-producing trees in the project area that would provide seed for whitebark pine regeneration may be relatively resistant to white pine blister rust (Hoff et al. 2001), therefore the treatments may be increasing the establishment of trees that are more resistant to the white pine blister rust than the past forest. However, the level of white pine blister rust resistance, or the type of resistance is not known for any of the potential whitebark pine seed trees in the project area. About 3,894 acres of unit area would be treated within which (1) whitebark pine would be thinned around which would increase tree vigor and the progression of the disease, and (2) the treatment would increase the establishment of whitebark pine in small openings. Thinning around the trees and creating small openings would comprise a small portion of the treated acreage, however.

Dwarf Mistletoe

The presence of dwarf mistletoes would in general be reduced due to (1) preference in retaining other species over lodgepole pine, (2) preference in retaining less infected trees over more infected trees in mechanical treatment units, (3) tendency for infected trees to be damaged and die from prescribed burning (Harrington and Hawksworth 1990, Conkin 2000, Conklin and Armstrong 2002), and (4) tendency for infected tree branches to be damaged and die from prescribed burning (Harrington and Hawksworth 1990, Conkin 2000, Conklin and Armstrong 2002). Although the presence and magnitude of dwarf mistletoe is not mapped and it is not present on all unit acres, this alternative could potentially reduce dwarf mistletoe over about 8,516 acres containing lodgepole pine.

Armillaria

The presence of armillaria would not be directly reduced by the treatments, but treatments in stands would reduce both short-term and long-term impacts from the disease due to increases in more resistant tree species, promoting tree vigor, and reforesting to tree species suitable to the sites (Rippy et al. 2005).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

More information about compliance with standards and direction from the Forest Plan is in appendix B. Compliance of alternative 2 with Forest Plan forestwide standards pertinent to this discussion are displayed in volume 2, appendix B, table B-7. Compliance with management area standards is displayed in table B-8, and compliance with Forest Plan direction for regeneration harvest is displayed in table B-9.

Alternative 3

About 6,564 acres of treatment is proposed under this alternative. This is about 27 percent of the project area. The proposed treatments for each unit are displayed in table 22 and figure 33. Total acres for each prescription group are displayed in table 23. Treatment effects for groups 1 through 8 are the same as described for alternative 2 above.

Table 22. Alternative 3 proposed treatments by group and unit

Group	Unit	Treatment Type	Prescription	Regeneration	Acres
1	15	Intermediate Harvest	Improvement Cut, Underburn	N/A	15
1	23	Intermediate Harvest	Improvement Cut, Underburn	N/A	29
1	24	Intermediate Harvest	Improvement Cut, Underburn	N/A	5
1	28	Intermediate Harvest	Improvement Cut, Underburn	N/A	22
1	46b	Intermediate Harvest	Improvement Cut, Jackpot Burn, Handpiling, Burn Piles	N/A	27
1	47b	Intermediate Harvest	Improvement Cut, Jackpot Burn, Handpiling, Burn Piles	N/A	9
1	47c	Intermediate Harvest	Improvement Cut, Jackpot Burn, Handpiling, Burn Piles	N/A	31
1	6	Intermediate Harvest	Improvement Cut, Underburn	N/A	14
1	7	Intermediate Harvest	Improvement Cut, Underburn	N/A	17
1	8	Intermediate Harvest	Improvement Cut, Underburn	N/A	62
2	14	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	11
2	16	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	3
2	3	Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	N/A	37
2	48	Intermediate Harvest	Precommercial Thin, Underburn	N/A	141
2	50	Intermediate Harvest	Precommercial Thin	N/A	49
2	51	Intermediate Harvest	Precommercial Thin, Underburn or Slash Treatment along PVT	N/A	193
2	59	Intermediate Harvest	Precommercial Thin	N/A	16
2	61a	Intermediate Harvest	Precommercial Thin, Handpile Underburn	N/A	9
2	62	Intermediate Harvest	Precommercial Thin	N/A	37
2	63	Intermediate Harvest	Precommercial Thin	N/A	17
2	66	Intermediate Harvest	Precommercial Thin	N/A	26
2	67	Intermediate Harvest	Precommercial Thin	N/A	20
2	68	Intermediate Harvest	Precommercial Thin	N/A	15
2	69	Intermediate Harvest	Precommercial Thin	N/A	31
2	70	Intermediate Harvest	Precommercial Thin	N/A	39
2	71	Intermediate Harvest	Precommercial Thin	N/A	40
2	72	Intermediate Harvest	Precommercial Thin	N/A	85

Group	Unit	Treatment Type	Prescription	Regeneration	Acres
2	73	Intermediate Harvest	Precommercial Thin	N/A	33
2	75b	Intermediate Harvest	Precommercial Thin, Jackpot Burn, Handpiling, Burn Piles	N/A	20
3	1	Regeneration Harvest	Shelterwood (Group) with Reserves, Site Prep Burn	NRG DF/LP, Plant PP/WL	96
3	11	Regeneration Harvest	Shelterwood (Group) with Reserves, Underburn	NRG DF/LP/ES/AS, Plant PP	23
3	12	Regeneration Harvest	Shelterwood (Group) with Reserves, Underburn	NRG DF/LP/ES/AS, Plant PP	80
3	13	Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	NRG DF/LP/AS	41
3	22a	Regeneration Harvest	Shelterwood with Reserves, Site Prep Burn	NRG DF/LP	22
3	25	Regeneration Harvest	Seedtree with Reserves, Broadcast Burn	NRG DF/LP, Plant PP/WL	29
3	34	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant DF/WL	12
3	39	Regeneration Harvest	Seedtree with Reserves, Underburn	NRG LP/DF, Plant DF/PP	26
3	40	Regeneration Harvest	Seedtree with Reserves, Underburn	NRG LP/DF, Plant DF/PP	11
3	41	Regeneration Harvest	Shelterwood (Group) with Reserves, Underburn	NRG LP/DF, Plant DF/PP	12
3	42	Regeneration Harvest	Seedtree with Reserves, Underburn	NRG LP/DF, Plant DF/PP	65
3	43	Regeneration Harvest	Seedtree with Reserves, Underburn	NRG LP/DF, Plant DF/PP	104
3	53	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant DF/WL	17
3	57	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant PP	93
3	58	Regeneration Harvest	Shelterwood (Group) with Reserves, Jackpot Burn	NRG DF/LP, Plant PP	15
3	9	Regeneration Harvest	Seedtree with Reserves, Slashing, Handpiling, Burn Piles	NRG DF/LP	18
4	10	Regeneration Harvest	Clearcut with Reserves, Underburn	NRG DF/LP, Plant PP	18
4	27	Regeneration Harvest	Clearcut with Reserves, Site Prep Burn	NRG LP/DF, Plant DF/PP/WL	31
4	35	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	24

Group	Unit	Treatment Type	Prescription	Regeneration	Acres
4	36	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF	20
4	37	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	8
4	38	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	7
4	52	Regeneration Harvest	Clearcut with Reserves, Broadcast Burn	NRG LP, Plant DF/WL	22
4	74	Regeneration Harvest	Clearcut with Reserves, Site Prep Burn	NRG, plant	23
5	4	Intermediate Harvest	Sanitation, Slashing, Handpiling, Burn Piles	N/A	7
5	5	Intermediate Harvest	Sanitation, Slashing, Handpiling, Burn Piles	N/A	18
6	2	Prescribed Fire	Low Severity Fire, Openings <5 acres	NRG PP/DF	146
6	78	Prescribed Fire	Low Severity Fire, Openings <5 acres	NRG DF/LP/PP	38
6	85	Prescribed Fire	Low Severity Fire, Openings <5 acres	Natural Recovery	143
7	87	Prescribed Fire	Mixed Severity Fire, Openings <5 acres	NRG LP/DF/AS	36
8	79	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	NRG LP/DF/PP/WB	337
8	82	Prescribed Fire	Mixed Severity Fire, Openings <75 acres	Natural Recovery	776
8	83	Prescribed Fire	Mixed Severity Fire, Openings <75 acres	Natural Recovery	457
8	84	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	Natural Recovery	831
8	88	Prescribed Fire	Mixed Severity Fire, Openings <30 acres	Natural Recovery	865
9	17a	Prescribed Fire	Underburn	NRG LP/DF, Plant PP	38
9	19a	Prescribed Fire	Underburn	To Be Determined	15
9	20a	Prescribed Fire	Underburn	To Be Determined	24
9	29a	Prescribed Fire	Underburn	N/A	25
9	30a	Prescribed Fire	Underburn	N/A	14
9	31a	Prescribed Fire	Underburn	N/A	16
9	32a	Prescribed Fire	Underburn	N/A	45
9	44a	Prescribed Fire	Underburn	N/A	97
9	45a	Prescribed Fire	Underburn	N/A	38
9	80a	Prescribed Fire	Jackpot Burn	N/A	326
10	46a	Intermediate Harvest	Improvement Cut, Jackpot Burn, Handpiling, Burn Piles	N/A	223
10	47a	Intermediate Harvest	Improvement Cut, Jackpot Burn, Handpiling, Burn Piles	N/A	180

Table 23. Alternative 3 total treatment acres by prescription group

Group	Alternative 3 Acres
1	232
2	822
3	664
4	152
5	25
6	326
7	36
8	3,265
9	637
10	403
Total	**6,564**

For alternative 3, the interdisciplinary team developed two additional prescription groups.

Group 9: This group contains 10 units that are also described above and displayed in table 15 as being in groups 1, 3, and 4. These are a mixed group of units whose common characteristic is that the proposed treatment was changed to a low-intensity and low-severity underburn in Alternative 3. The units are mixed species and dominated (greater than one-half of the basal area) by either lodgepole pine (Units 17a, 19a, 20a, and 29a) or Douglas-fir (Units 30a, 31a, 32a, and 44a) with ponderosa pine, western larch, Engelmann spruce or aspen components. The average age in the units ranges from 85 to 150 years, average overstory diameter ranges from 11 to 16 inches d.b.h. and stocking can be considered high, or at least could be before the mountain pine beetle epidemic. Mountain pine beetle mortality ranges from high in the Douglas-fir units to severe in those dominated by lodgepole pine. Units 30a, 31a, 32a, and 44a are generally single-story but do have patches of understory, which is mostly Douglas-fir. Units 17a, 19a, 20a, and 29a are generally two-story (or were before the mountain pine beetle epidemic) with sapling and pole understories of mostly Douglas-fir with minor lodgepole pine and subalpine fir components.

Group 10: This group includes units 46a and 47a, which in Alternative 2 are proposed for treatment under Group 1. Treatments would be designed in a mosaic pattern to maintain cover and forage for wildlife while promoting ponderosa pine and aspen, and reducing ladder fuels. Portions of the stands would be thinned to (1) reduce understory competition from around large ponderosa pine trees, (2) thin heavily-stocked groups of trees on sites historically dominated by ponderosa pine, and (3) remove conifer competition from within and around quaking aspen.

To reduce understory competition around large ponderosa pine, and move areas toward or maintain multi-storied ponderosa pine structure, within 50 feet of ponderosa pine trees larger than 17 inches d.b.h. remove all but two trees. The retained trees should be of varied size and age classes.

In areas dominated by ponderosa pine, but lacking live trees greater than 17 inches d.b.h., trees would be thinned to 48 to 109 trees per acre depending upon tree size. Ponderosa pine snags greater than 17 inches d.b.h. would be favored for retention to meet Forest Plan direction for snags. Conifers less than 17 inches d.b.h. would be removed up to 100 feet of existing aspen patches. Post-thinning, slash would be jackpot burned or hand-piled and burned to reduce fuels. Treatments would affect up to 50 percent of these units.

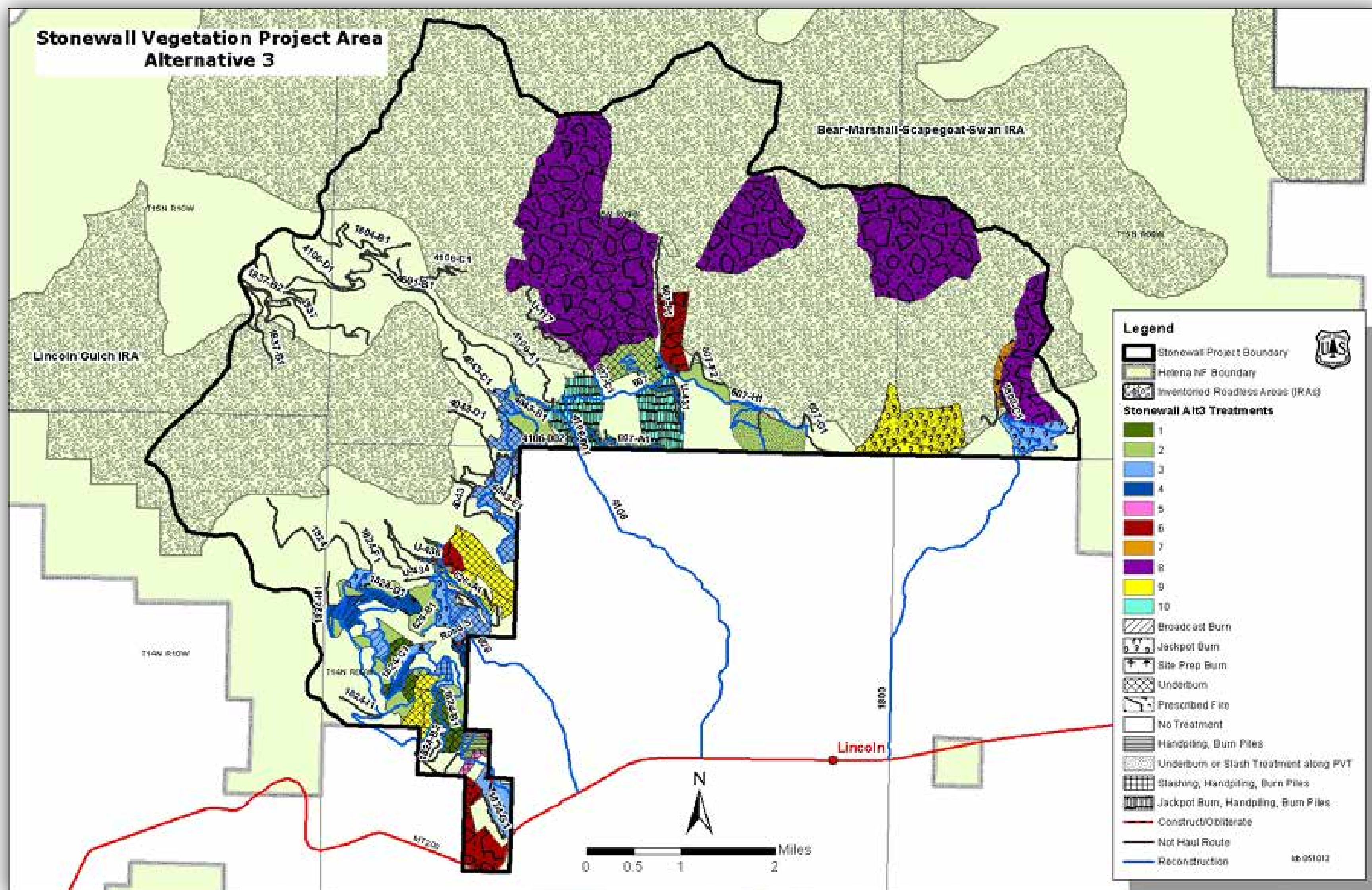

Figure 33. Alternative 3 harvest and fuels treatments

Direct and Indirect Effects

Prescription Groups

Group 9 effects would differ somewhat between those described above as dominated by lodgepole pine and those dominated by Douglas-fir. In Units 30a, 31a, 32a, and 44a, the low-intensity and low-severity underburns would result in sapling and pole tree mortality, with most of the mortality being in the saplings and few poles being killed. Due to the already single-story nature of the stands, the post-treatment diameter distributions would change little, and stand structures would not change. Figure 34 displays the projected post-underburn diameter distribution for Stand 41502043 (Unit 30a and part of Unit 32a). The dead trees are not being shown. The modeling exercise shows the very small trees being killed, but almost no trees above the 8-inch d.b.h. class when compared with the current condition (figure 24).

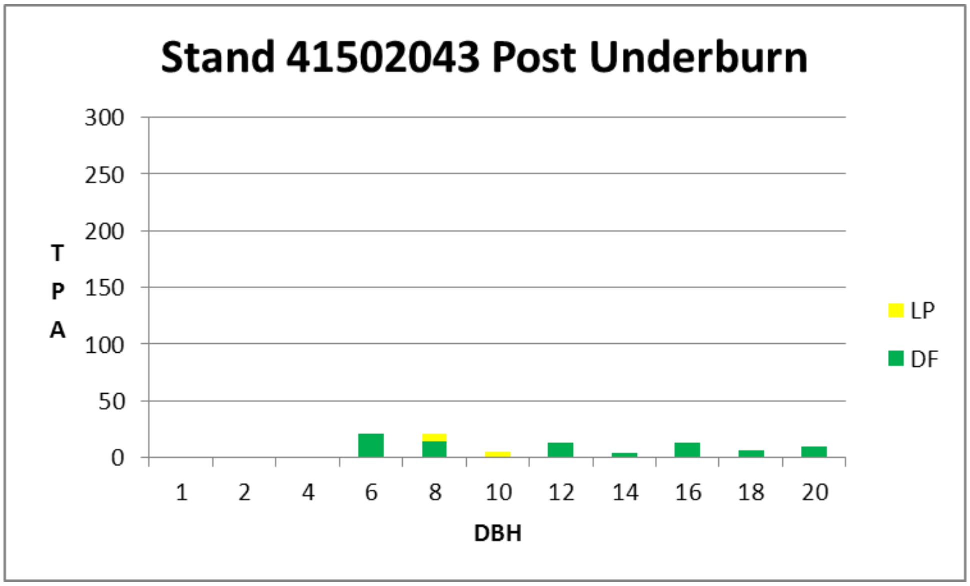

Figure 34. Stand 41502043 post underburn

In Units 17a, 19a, 20a, and 29a, which were two-story before the mountain pine beetle epidemic and are now more single-story, the underburn would also result in sapling and pole tree mortality with most of the mortality being to the saplings. Stand structures would not change, but the stand understories would be more open. Figure 35displays the projected post-underburn diameter distribution for Stand 41501056 (Unit 17a). The dead trees are not being shown. The modeling exercise shows many, but not all, of the very small trees being killed, but almost no trees above the 8-inch d.b.h. class when compared with the current condition (figure 25).

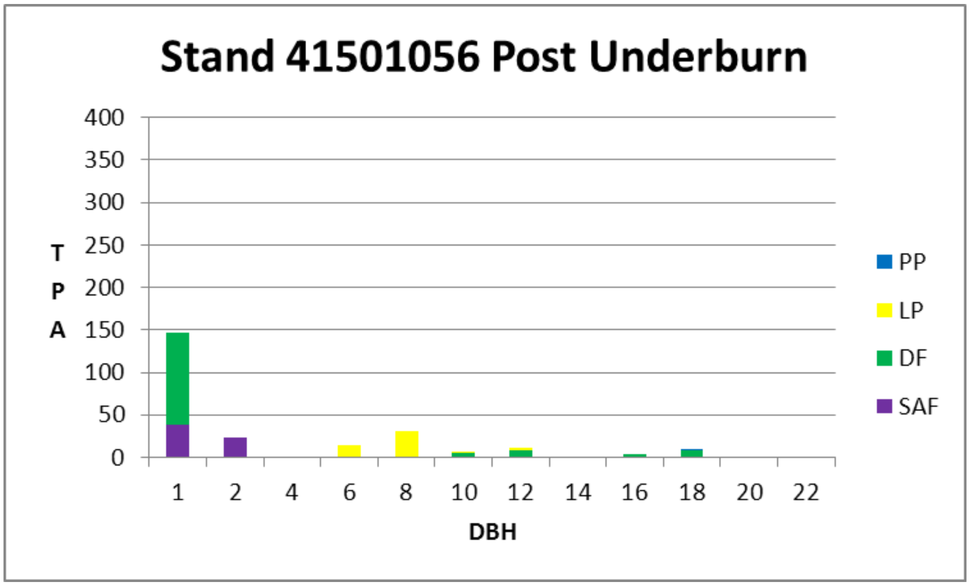

Figure 35. Stand 41501056 post underburn

Group 10 treatments would reduce stand mid-stories and understories and the stands would be more open, but since only up to one-half of the stand areas are being treated they would become patchier. Stand structures would not change.

Figure 36 and figure 37 display the projected post-underburn diameter distribution for Stand 42303130 (Unit 46a). Figure 36 scale is the same as shown above for the current condition (figure 18), and figure 37 scale has been changed to better display the larger trees. The post-treatment stand would have 974 TPA, with about 13 TPA greater than 17 inches d.b.h. About 632 TPA less than 1 inch in d.b.h. are not being displayed.

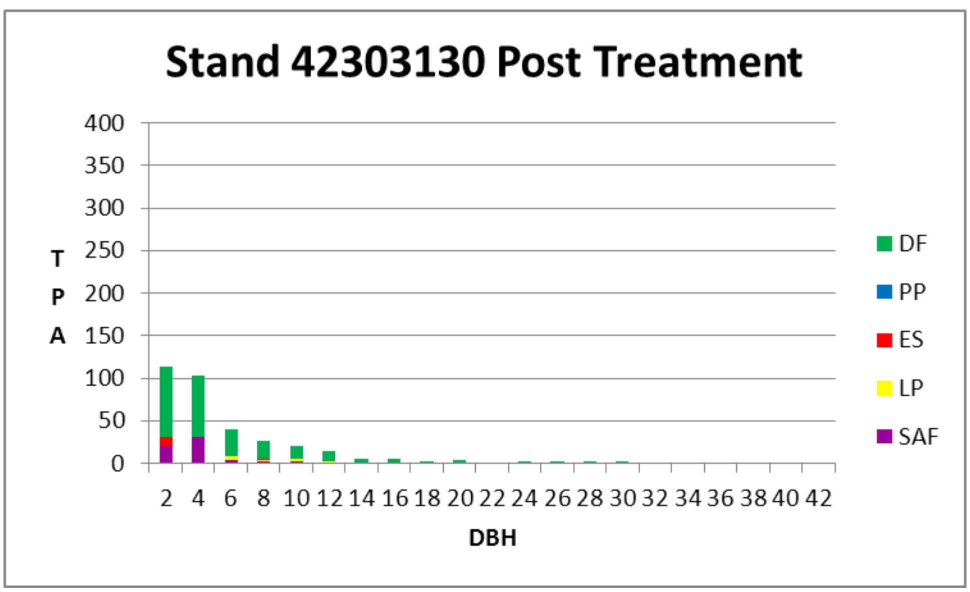

Figure 36. Stand 42303130 (Unit 46a) post-treatment in alternative 3

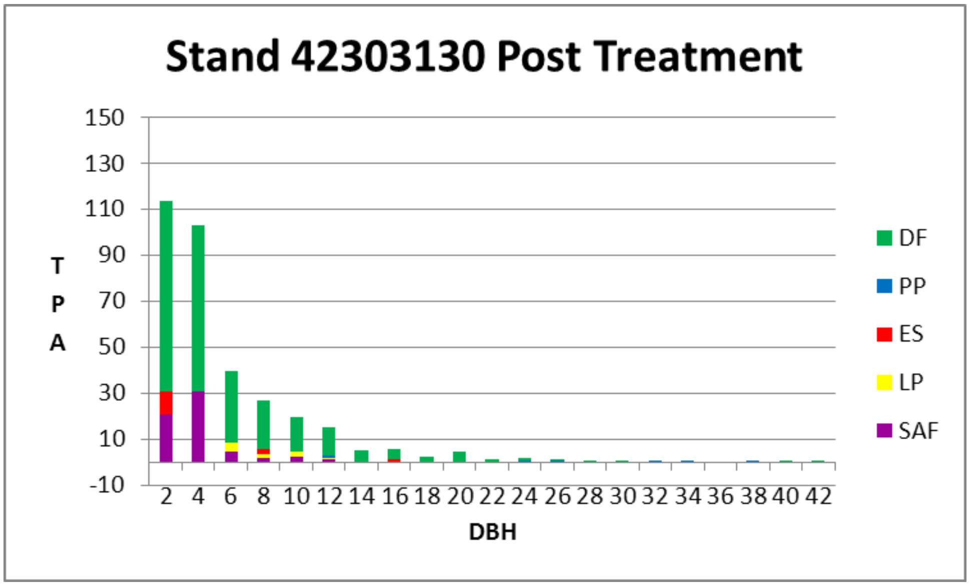

Figure 37. Stand 42303130 (Unit 46a) post-treatment in alternative 3

Biophysical Settings and Vegetation-fuel Classes

Proposed treatments would change vegetation-fuel classes in the project area as described above. Table 24 displays our projected vegetative fuel class matrix for each BpS under alternative 3 (A3), the current vegetation-fuel class matrix (Cur), and the desired (Ref) vegetation-fuel class matrix. Table cells that are colored red or orange BpS/vegetation-fuel class combinations are under-represented on the landscape, those that are colored green and yellow are over-represented, and no color is close to that desired. All but the CLSO, BMSC, and DLSO vegetation-fuel class for the upper subalpine fir BpS, the BMSC and DLSO vegetation-fuel classes for the lower subalpine BpS, and the DLSO vegetation-fuel class for the moist Douglas-fir BpS would move toward the desired levels. Four of the vegetation-fuel class/BpS combinations are within 20 percent of the desired condition and we consider them "close" to the desired.

Table 24. Alternative 3 post-treatment, current and desired vegetation-fuel classes by BpS

	AESP	BMSC	CMSO	DLSO	ELSC
BpS	**A3/ Cur/ Ref**	**A3/ Cur/ Ref**	**A3/ Cur/ Ref**	**A3/ Cur/ Ref**	**A3/ Cur/ Ref**
Douglas-fir Interior Northern and Central Rocky Mountains (Dry)	6/ 2/ 15	25/ 31/ 25	8/ 4/ 20	14/ 8/ 25	47/ 55/ 15
Douglas-fir Interior Northern and Central Rocky Mountains (Moist)	4/ 1/ 15	27/ 35/ 25	11/ 5/ 20	16/ 10/ 25	42/ 50/ 15
Ponderosa Pine-Douglas-fir	11/ 1/ 15	20/ 31/ 10	7/ 0/ 25	16/ 1/ 40	45/ 67/ 10
Interior West Lower Subalpine Forest	5/ 1/ 20	15/ 21/ 40	12/ 7/ 10	32/ 25/ 5	37/ 46/ 25

BpS	AESP A3/ Cur/ Ref	BMSC A3/ Cur/ Ref	CMSO A3/ Cur/ Ref	DLSO A3/ Cur/ Ref	ELSC A3/ Cur/ Ref
Interior West Upper Subalpine Forest	3/ 0/ 20	21/ 22/ 25	11/ 11/ 25	27/ 22/ 15	38/ 46/ 15

Yellow – High (Greater than desired but less than 180 percent of desired)
Orange – Low (Greater than or equal to 20 percent but less than desired)
No Color – Within 20% of desired
Green – Very High (Greater than or equal to 180 percent of desired)
Red – Very Low (less than 20 percent of desired)

Species of Interest

Ponderosa Pine

This alternative would increase ponderosa pine presence in treated stands, with the degree of increase varying depending upon the type of treatment and the individual stand. Depending upon the treatment and unit, ponderosa pine would increase due to (1) retaining PP over less preferred species during thinning increasing PP as a portion of future stand stocking relative to less preferred species, (2) increased natural establishment of PP, and (3) planting PP. The degree of PP increase is displayed in table 25. Ponderosa pine would increase to some degree on about 13 percent of the project area.

Table 25. Alternative 3 effects of treatment groups on ponderosa pine

Treatment	Degree of PP Increase	Acres
Group 1 –Intermediate Harvest	Increase in presence relative to less preferred species during thinning tree selection to long-term small increase in number of trees due to increased establishment in more open stands	181
Group 2 –Pre-commercial thin	Increase in presence relative to less preferred species, no increase in number of trees. Note that in some units PP is not currently present.	447
Group 3 - Seedtree and shelterwood harvest/regeneration	Substantial short and long-term increase due to planting and natural regeneration	547
Group 4 – Clearcut harvest/regeneration	Substantial short and long-term increase due to planting and natural regeneration	49
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	Increase in presence relative to less preferred species during thinning tree selection, small due to current “trace” presence	25
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	Increase in presence relative to other species due to higher ponderosa pine fire-tolerance and in tree numbers due to PP establishment in open areas	326
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	Increase in presence relative to other species due to higher ponderosa pine fire-tolerance and in tree numbers due to PP establishment in open areas	0
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	Increase in presence relative to other species due to higher ponderosa pine fire-tolerance and in tree numbers due to PP establishment in open areas	1168
Group 9 - Low-intensity and severity prescribed burning	Increase in presence relative to less fire-resistant species (Units 31a, 32a, 44a, 45a)	196

Treatment	Degree of PP Increase	Acres
Group 10 – Mix of Intermediate Harvest and no treatment	Increase in presence relative to less preferred species during thinning tree selection to long-term very small increase in number of trees due to increased establishment in more open stands	200

Quaking Aspen

Alternative 3 would also increase the presence of quaking aspen (AS) as a stand component where it is found in treated stands, with the degree of increase varying depending upon the type of treatment and the individual stand. The degree of AS increase is displayed in table 26. Quaking aspen would increase to some degree on about 6 percent of the project area.

Table 26. Alternative 3 effects of treatment groups on quaking aspen

Treatment	Degree of AS Increase	Acres
Group 1 –Intermediate Harvest	Increase in presence relative to less preferred species during thinning tree selection and increase in suckering, may be some top-killing of aspen during burning	83
Group 2 –Pre-commercial thin	Increase in presence relative to less preferred species during thinning tree selection and increase in suckering	326
Group 3 - Seedtree and shelterwood harvest/regeneration	Increase in suckering, may be some top-killing of aspen during burning	396
Group 4 – Clearcut harvest/regeneration	Increase in suckering, may be some top-killing of aspen during burning	0
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	Increase in presence relative to less preferred species during thinning tree selection, may be a small increase in suckering	25
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	May be some top-killing of existing stems, increased suckering due to increases in growing space	146
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	May be some top-killing of existing stems, increased suckering due to increases in growing space	36
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	May be some top-killing of existing stems, increased suckering due to increases in growing space	337
Group 9 - Low-intensity and severity prescribed burning	May be some increase as a response to MPB mortality and prescribed burning	39
Group 10 – Mix of Intermediate Harvest and no treatment	Increase in presence due to competing conifer removal	<20

Western Larch

Alternative 3 would also increase the presence of western larch (WL) as a stand component with the degree of increase varying depending upon the type of treatment and the individual stand. Western larch would increase due to (1) retaining larch over less preferred species during thinning increasing its relative presence as a portion of future stand stocking, (2) planting larch in regeneration units, and (3) natural regeneration in regeneration units. The degree of WL increase is displayed in table 27. Western larch would increase to some degree on about 2 percent of the project area.

Table 27. Alternative 3 effects of treatment groups on western larch

Treatment	Degree of WL Increase	Acres
Group 1 –Intermediate Harvest	Increase in presence relative to less preferred species during thinning tree selection, mostly small due to trace current stocking of WL	5
Group 2 –Pre-commercial thin	Increase in presence relative to less preferred species during thinning tree selection, mostly small due to small current stocking of WL	197
Group 3 - Seedtree and shelterwood harvest/regeneration	Substantial increase in numbers due to planting	176
Group 4 – Clearcut harvest/regeneration	Substantial increase in numbers due to planting	91
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	No increase expected due to lack of presence	0
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	No increase expected due to lack of presence	0
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	No increase expected due to lack of presence	0
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	No increase expected due to lack of presence	0
Group 9 - Low-intensity and severity prescribed burning	Increase in presence relative to less fire-resistant species	38
Group 10 – Mix of Intermediate Harvest and no treatment	No increase expected due to lack of presence	0

Whitebark Pine

The effects of this alternative would be to increase the presence of whitebark pine (WB) as a stand component where it is found in treated stands, with the degree of increase varying depending upon the type of treatment and the individual stand (table 28). Whitebark pine would increase due to (1) retaining WB over less preferred species during thinning increasing its relative presence as a portion of future stand stocking, (2) natural regeneration in burning units. The degree of WB increase is displayed in table 28. Whitebark pine would increase to some degree on about 14 percent of the project area.

Table 28. Alternative 3 effects of treatment groups on whitebark pine

Treatment	Degree of WB Increase	Acres
Group 1 –Intermediate Harvest	No increase expected due to lack of presence	NA
Group 2 –Pre-commercial thin	No increase expected due to lack of presence	NA
Group 3 - Seedtree and shelterwood harvest/regeneration	No increase expected due to lack of presence	NA
Group 4 – Clearcut harvest/regeneration	No increase expected due to lack of presence	NA
Group 5 - Remove dead and dying trees, slash noncommercial-sized trees	No increase expected due to lack of presence	NA

Treatment	Degree of WB Increase	Acres
Group 6 – Low-intensity prescribed burning with 5-10 acre mortality patches	Increase in presence due to establishment in open areas	NA
Group 7 – Mixed-severity prescribed burning with 5, 10, 20 acre mortality patches	No increase expected due to lack of presence	NA
Group 8 – Mixed-severity prescribed burning with 30-75 acre mortality patches	Increase in presence due to establishment in open areas	3,265
Group 9 - Low-intensity and severity prescribed burning	No increase expected due to lack of presence	NA
Group 10 – Mix of Intermediate Harvest and no treatment	No increase expected due to lack of presence	NA

Insects and Diseases

Mountain Pine Beetle

Under Alternative 3, treatments would reduce stocking on about 6,564 acres containing lodgepole, whitebark, or ponderosa pine trees. These treatments would reduce stocking and so mountain pine beetle risk with the effects lasting into the long term. However, as noted above, the recent mountain pine beetle epidemic has already reduced stocking in many stands, effectively reducing risk.

Douglas-fir Beetle

Under alternative 3, thinning and prescribed burning activities would reduce the risk of losing large Douglas-fir in treated stands into the long-term on at least 5,203 acres. Outside of the treatment units DFB activity would continue as discussed above for untreated stands.

Prescribed burning would result in a relatively small and short-term increase in Douglas-fir beetle risk to individual large Douglas-fir on about 3,031 acres. There would be a very small increase in risk to Douglas-fir over the landscape.

Western Spruce Budworm

All treatments proposed in this alternative would reduce Douglas-fir, Engelmann spruce, and subalpine fir and so the predisposition of stands to be impacted by WSB on about 5,288 acres. These effects would continue into the long term. On the remaining untreated area, WSB populations would continue as described above.

White Pine Blister Rust

As with alternative 2, the presence of white pine blister rust would not be reduced by the treatments, but small openings would be created to increase the regeneration of whitebark pine which may have some degree of resistance to the rust. About 2,265 acres of unit area would be treated within which the treatment would (1) thin around present whitebark pine, increasing vigor and the progression of the disease, and (2) increase the establishment of whitebark pine in small openings. The thinned areas and openings would comprise a small portion of the treated unit acreage.

Dwarf Mistletoe

As in alternative 2, the presence of dwarf mistletoes would in general be reduced due to (1) preference in retaining other species over lodgepole pine, (2) preference in retaining less infected trees over more infected trees in mechanical treatment units, (3) tendency for infected trees to be damaged and die from prescribed burning, and (4) tendency for infected tree branches to be damaged and die from prescribed burning. Although the presence and magnitude of dwarf mistletoe is not mapped and is certainly not present on all unit acres, this alternative could potentially reduce dwarf mistletoe about 6,564 acres containing lodgepole pine.

Armillaria

The presence of armillaria would not be directly reduced by the treatments, but treatments in stands would reduce both short-term and long-term impacts from the disease due to increases in more resistant tree species, promoting tree vigor, and reforesting to tree species suitable to the sites (Rippy et al. 2005).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

More information about compliance with standards and direction from the Forest Plan is in appendix B. Compliance of alternative 3 with Forest Plan forestwide standards pertinent to this discussion are displayed in volume 2, appendix B, table B-10. Compliance with management area standards is displayed in table B-11, and compliance with Forest Plan direction for regeneration harvest is displayed in table B-12.

Alternative Comparison

Purpose and Need: Enhance and Restore Aspen, western larch, and ponderosa pine species and habitats

To compare the three alternatives success in restoring and enhancing aspen, western larch, and ponderosa pine, in this analysis we compare (1) how the alternatives would result in within-stand changes in tree species compositions as a result of proposed treatments and the (2) proportion of the analysis area on which quaking aspen, western larch, and ponderosa pine would increase in presence. Since whitebark pine has been declining in presence due to disease and bark beetle activity and is now considered a sensitive species in Region 1, we also included it in this discussion. As discussed above, whether a treatment would result in an increase in a particular tree species depends upon the type of treatment, the characteristics of the tree species, and the current presence of the tree species in the area receiving the treatment. Treatments vary widely in the opportunity they provide to manipulate the presence of a particular species. Intermediate treatments provide a great deal of control through tree selection preferences applied during thinning if the tree species is present and regeneration treatments provide a great deal of control through control of seed sources and planting of preferred species. Prescribe burns provide opportunities to increase fire-tolerant or shade-intolerant early seral species such as ponderosa pine, western larch, and quaking aspen through killing competing fire-intolerant species and through creating open areas for regeneration although the degree of control is not great simply due to the variable nature of prescribed burning.

For alternative 2, tables 9, 10, 11 and 12 display the expected degree of increase for ponderosa pine, quaking aspen, western larch, and whitebark pine for each treatment group and acreage estimates over which those increases would occur. The same information for alternative 3 can be found in tables 16, 17, 18 and 19. In table 29 that follows, we summarize the effects of the three alternatives upon within-stand tree species compositions by treatment group and as a proportion of the landscape. Alternative 1 would continue the current condition in which the four species have declined in presence within stands and upon the landscape due to succession and the recent mountain pine beetle epidemic. In the long-term, those four species would continue to decline as succession continues. Alternatives 2 and 3 would result in an increase in the presence of all four species, with alternative 2 leading to the greatest increase due to the greater treatment area involved, and the greater area in regeneration and intermediate treatments which have the greatest potential for modifying species composition at the stand level.

Table 29. Alternative comparison for ponderosa pine, western larch, whitebark pine, and aspen

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Within stand changes in tree species compositions in proposed treatment units by prescription group	All groups: little short-term change from current condition, long-term widespread increase in Engelmann spruce (ES), subalpine fir (SAF), and Douglas-fir (DF) due to succession; long-term continuation of lodgepole in individual stands as it regenerates following the bark beetle epidemic and long-term landscape-level decline due to succession; long-term decrease in ponderosa pine, quaking aspen, western larch, and whitebark pine in individual stands and on the landscape	**Group 1**: reduce Engelmann spruce (ES), subalpine fir (SAF), lodgepole pine (LP), and Douglas-fir (DF) on 974 acres; increase in ponderosa pine (PP) on 845 acres, western larch (WL) on 5 acres, aspen (AS) on 547 acres, whitebark pine (WB) on 0 acres **Group 2**: reduce ES, SAF,LP, DF on 1,132 acres; increase PP on 651 acres, WL on 303 acres, AS on 402 acres, WB on 0 acres **Group 3**: reduce ES, SAF,LP, DF on 745 acres; increase PP on 633 acres, WL on 184 acres, AS on 410 acres, WB on 0 acres **Group 4**: reduce ES, SAF,LP, DF on 223 acres; increase PP on 102 acres, WL on 146 acres, AS on 15 acres, WB on 0 acres **Group 5**: reduce ES, SAF,LP, DF on 25 acres; increase PP on 25 acres, WL on 0 acres, AS on 25 acres, WB on 0 acres **Group 6**: reduce ES, SAF,LP, DF on 449 acres; increase PP on 326 acres, WL on 0 acres, AS on 146 acres, WB on 123 acres **Group 7**: reduce ES, SAF,LP, DF on 410 acres; increase PP on 374 acres, WL on 0 acres, and AS on 410 acres, WB on 0 acres **Group 8**: reduce ES, SAF,LP, DF on 8,564 acres; increase PP on 2,506 acres, WL on 0 acres, and AS on 337 acres, WB on 3,894 acres	**Group 1**: reduce Engelmann spruce (ES), subalpine fir (SAF), lodgepole pine (LP), and Douglas-fir (DF) on 232 acres; increase in ponderosa pine (PP) on 181 acres, western larch (WL) on 5 acres, aspen (AS) on 83 acres, whitebark pine (WB) on 0 acres **Group 2**: reduce ES, SAF,LP, DF on 822 acres; increase PP on 447 acres, WL on 197 acres, AS on 326 acres, WB on 0 acres **Group 3**: reduce ES, SAF,LP, DF on 664 acres; increase PP on 547 acres, WL on 176 acres, AS on 396 acres, WB on 0 acres **Group 4**: reduce ES, SAF,LP, DF on 152 acres; increase PP on 49 acres, WL on 91 acres, AS on 0 acres, WB on 0 acres **Group 5**: reduce ES, SAF,LP, DF on 25 acres; increase PP on 25 acres, WL on 0 acres, AS on 25 acres, WB on 0 acres **Group 6**: reduce ES, SAF,LP, DF on 326 acres; increase PP on 326 acres, WL on 0 acres, AS on 146 acres, WB on 0 acres **Group 7**: reduce ES, SAF,LP, DF on 36 acres; increase PP on 0 acres, WL on 0 acres, and AS on 36 acres, WB on 0 acres **Group 8**: reduce ES, SAF,LP, DF on 3,265 acres; increase PP on 1,168 acres, WL on 0 acres, and AS on 337 acres, WB on 3,894 acres **Group 9**: reduce ES, SAF,LP, DF on 637 acres; increase PP on 196 acres, WL on 38 acres, and AS on 39 acres, WB on 0 acres **Group 10**: reduce ES, SAF,LP, DF on 403 acres; increase PP on 200 acres, WL on 0 acres, and AS on <20 acres, WB on 0 acres

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Landscape-level changes in the presence of aspen, western larch, ponderosa pine, and whitebark pine	Short term would be no change in ponderosa pine, western larch, whitebark pine, slight increase in quaking aspen; long-term decline in all four species	**Ponderosa pine**: increase to some degree on about 23 percent of project area **Quaking aspen**: increase to some degree on about 10 percent of project area **Western larch**: increase to some degree on about 3 percent of project area **Whitebark pine**: increase to some degree on about 17 percent of project area	**Ponderosa pine**: increase to some degree on about 13 percent of project area **Quaking aspen**: increase to some degree on about 6 percent of project area **Western larch**: increase to some degree on about 2 percent of project area **Whitebark pine**: increase to some degree on about 14 percent of project area

Purpose and Need: Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects

To compare how the three alternatives would improve the mix of vegetation composition and structure across the landscape, we compare (1) the expected within-stand changes in stand structures and species compositions in terms of tree diameter distributions for proposed treatment type groups, and (2) landscape-level changes in stand structures in terms of the proportion of change within BpS/vegetation-fuel class combinations.

In table 30 we display the expected effects of the three alternatives on within-stand species compositions. Under alternative 1, the current condition would persist, and the general track of tree species on the landscape would be toward increases in Douglas-fir, subalpine fir, and Engelmann spruce and decreases in the early seral species—ponderosa pine, quaking aspen, western larch, whitebark pine, and lodgepole pine. Lodgepole pine would regenerate in many areas in which it was a major component before the mountain pine beetle epidemic, becoming a component in mixed-species stands with Douglas-fir, Engelmann spruce, and subalpine fir. Treatments in both alternatives 2 and 3 would modify the current condition and increase ponderosa pine, western larch, quaking aspen, and whitebark pine as discussed above. Both alternatives would improve the mix of tree species in treated areas, resulting in tree species mixtures that would be more diverse and resilient. Alternative 2 would result in greater effects than Alternative 3 due to the greater acreage treated, and the greater acreage treated with intermediate and regeneration treatments.

In table 30 we compare the effects of the three alternatives on stand structures in terms of tree diameter distributions for proposed treatment type groups. Alternative 1 would continue the current condition in the short term and long term; stand understories would become denser and the stands more closed. Stand diameter distributions as displayed in figures 2 through 9 would remain the same in the short term and in the long term would tend to become more steeply weighted toward smaller diameters due to ingrowth and natural mortality of the larger diameter classes. Treatments in both alternatives 2 and 3 would modify the track that the stands are on with the degree and nature of the effects depending upon the type of treatment. Intermediate harvests (Groups 1 and 10) would "flatten" the diameter distributions by thinning small and mid-sized trees while retaining the largest trees—creating open multi-story structures. Precommercial thinning (Group 2) would create open, single-story stands by pre-commercially thinning even-aged, closed, single-story plantations. Regeneration treatments (Groups 3 and 4) would create even-aged stands with a small number of older and larger trees present as seed sources, shelter, or retention trees. Removing dead and dying trees and slashing undesirable understory trees (Group 5) would create stands that are open and almost single-story. Low-intensity prescribed burns (Groups 6 and 9) would flatten the diameter distributions due to killing many of the smaller diameter trees and would create stands that are more open and still multi-story. Mixed-severity prescribed burns (Groups 7 and 8) would create areas that are mosaics of structures including open and closed single-story, open and closed multi-story, and early-seral grass/forb/shrub openings. The effects of all treatments would last into the long-term but eventually the stands would become more closed and multi-story as trees grow and as the stand understories fill in.

Table 30. Alternative comparison for stand structures

Alternative 1	Alternative 2	Alternative 3
All groups: little short-term change from current condition; long-term increase in stand understories as stands impacted by mountain pine beetle regenerate and as shade-tolerant trees continue to become established; single-story stands would become multi-story	**Group 1 (974 acres)**: Stand diameter distributions would become almost flat (figure 10) compared to the current condition (figure 2); stands would be open multi-story structure in the short term but would become more closed multi-story in the long term as understories become denser **Group 2 (1,132 acres)**: Stand diameter distributions would become more single-story (figure 11) compared to current condition (figure 2) due to thinning of small suppressed trees; stands would be open single story in the short term, becoming closed single-story in the long term **Group 3 (745 acres)**: Stands would have larger green trees remaining (figure 11); they would be single-story and very open in the short-term and would become two-story and less open in the long term as they regenerate **Group 4 (223 acres)**: Stands have only small groups and individual reserve trees remaining; they would be very open in the short term and would become single-story and less open in the long term as they regenerate **Group 5 (25 acres)**: Stand diameter distributions would become more single-story (figure 12) compared to the current condition (figure 2) due to thinning the understory; they would be open and almost single-story in the short term and would become closed and two-story in the long term as understories redevelop **Group 6 (449 acres)**: Stand diameter distributions would become a little flatter (figure 13) than the current condition (figure 4) due to prescribed burn mortality in small trees; they would be open multi-story in the short term and would become closed multi-story in the long term as understories redevelop **Group 7 (410 acres)**: Stand structures would be very complex with tree distributions reflected in figures 1,3,4,5,6,7,8,10,11, and 12 being found within the burn units due to the highly variable nature of the treatment **Group 8 (4,604)**: Same as for group 7	**Group 1 (232 acres)**: Same as for Alternative 2 **Group 2 (822 acres)**: Same as for Alternative 2 **Group 3 (664 acres)**: Same as for Alternative 2 **Group 4 (152 acres)**: Same as for Alternative 2 **Group 5 (25 acres)**: Same as for Alternative 2 **Group 6 (326 acres)**: Same as for Alternative 2 **Group 7 (36 acres)**: Same as for Alternative 2 **Group 8 (3,265 acres)**: Same as for Alternative 2 **Group 9 (637 acres)**: Stand diameter distributions would become flatter (figures 18 and 19) than the current conditions (figures 8 and 9) due to the smallest diameter trees being mostly killed by the treatments; they would become more open in the short term but structures would not change from their current single-story and 2-stories. In the long term the single-story stands would become more 2-story. **Group 10 (403 acres)**: Stand diameter distributions would become flatter (figure 20) compared to the current condition (figure 2); because only up to one-half of the stands would be treated, they would be a combination of open multi-story structure and closed structure in the short term but would become closed multi-story in the long term as understories become denser in the treated areas

In table 31 we compare the effects of the three alternatives on stand structures at the landscape level by comparing the proportion of change within Biophysical Setting/vegetation fuel class combinations. The table displays the percent of BpS area in each vegetation/fuel class for the current condition (Cur) discussed in the Stone Dry Vegetation Report (Milburn et al. 2009), the reference condition (Ref) discussed in the Stone Dry Vegetation Report, that estimated to occur under alternative 2 (A2), and that estimated to occur under Alternative 3 (A3). Note that as discussed above, the current condition is from the Stone Dry Vegetation Report (Milburn et al. 2009) which does not include an in-depth analysis of vegetation-fuel class changes due to the recent mountain pine beetle epidemic. As discussed above: (1) the current condition may not fully reflect changes in vegetation-fuel classes due to the recent mountain pine beetle activity, and (2) changes in vegetation-fuel classes due to proposed treatments are modeled estimates, therefore one must not take the current and alternative estimates as precise values. In this analysis, we use table 31 to discuss and compare the direction and magnitude of vegetation-fuel class change.

As discussed and displayed above, under alternative 1 in the short term the current condition would persist, which in general is below desired in (1) early seral and mid-seral open for all Biophysical Settings, (2) mid-seral closed in the two subalpine fir Biophysical Settings, and (3) in late-seral open for the two Douglas-fir and the ponderosa pine-Douglas-fir Biophysical Settings (table 14). Vegetation-fuel classes are above desired in all other combinations. Long-term trends under alternative 1 would be: decreasing early seral, mid-seral closed, mid-seral open, and late-seral open in almost all Biophysical Settings due to tree growth and filling in of stand understories (table 14). Both alternative 2 and alternative 3 would: (1) increase area in early-seral for all BpS, (2) decrease area in mid-seral closed for all BpS, (3) increase area in mid-seral open for all but upper subalpine BpS, (4) increase area in late-seral open for all BpS, and (5) decrease area in late-seral closed in all Bps. Alternative 2 would bring about greater change than alternative 3 due largely to the greater acreage treated. Both alternatives 2 and 3 would move the vegetation-fuel classes toward the reference condition, but largely due to the small portion of the analysis area proposed for treatment there would still be relatively great differences between present and reference condition for many BpS/vegetation-fuel class combinations.

Table 31. Alternative comparison for landscape-level stand structures

BPS	AESP	BMSC	CMSO	DLSO	ELSC
	CUR/A2/A3/REF	CUR/A2/A3/REF	CUR/A2/A3/REF	CUR/A2/A3/REF	CUR/A2/A3/REF
Douglas-fir Interior Northern and Central Rocky Mountains-Dry (23 percent of analysis area)	2/7/6/15	31/21/25/25	4/12/8/20	8/19/14/25	55/41/47/15
Douglas-fir Interior Northern and Central Rocky Mountains-Moist (24 percent of analysis area)	1/6/4/15	35/22/27/25	5/14/11/20	10/18/16/25	50/39/42/15
Ponderosa Pine-Douglas-fir (32 percent of analysis area)	1/14/11/15	31/16/20/10	0/11/7/25	1/24/16/40	67/35/45/10
Interior West Lower Subalpine Forest (14 percent of analysis area)	1/5/5/20	21/15/15/40	7/12/12/10	25/32/32/5	46/37/37/25

BPS	AESP	BMSC	CMSO	DLSO	ELSC
	CUR/A2/A3/REF	CUR/A2/A3/REF	CUR/A2/A3/REF	CUR/A2/A3/REF	CUR/A2/A3/REF
Interior West Upper Subalpine Forest (2 percent of analysis area)	0/3/3/20	22/21/21/25	11/11/11/25	22/27/27/15	46/38/38/15

Purpose and Need: Forest health in terms of reduced susceptibility (increased resistance) of individual stands and the landscape to diseases and insects found within the project area of concern

In table 32 we compare the three alternatives in terms of susceptibility to several insects and diseases that are impacting stands in the project area. Under alternative 1, in the short term there would be little change from the current condition, which in general is (1) low and long term decreasing risk for those insects and diseases dependent upon early seral trees such as the pines (e.g. mountain pine beetle), (2) higher and long-term increasing risk and impacts from those dependent upon Douglas-fir, subalpine fir, and Engelmann spruce, and (3) relatively low but long-term increase in susceptibility to armillaria which affects all conifers but for which pines and western larch are more resistant than the other conifers. Both alternatives 2 and 3 would generally reduce susceptibility to insects and diseases in treated stands and on the landscape. Exceptions to this would be white pine blister rust, for which we cannot say that the treatments would directly reduce the disease and Douglas-fir beetle for which the prescribed burning may increase risk in the treated areas to a small degree and short period of time. Over the landscape, both alternatives would increase resistance to insects and diseases by increasing tree species diversity and age class diversity, reducing stocking and so increasing individual tree resistance, and modifying structures. Alternative 2 would reduce susceptibility to a greater degree than alternative 3, largely because a greater area is being treated.

Table 32. Alternative comparison for insects and diseases

Alternative 1	Alternative 2	Alternative 3
Mountain pine beetle: risk would be low in most stands and at a landscape level due to the recent epidemic; increasing stocking would result in increased risk to remaining large ponderosa pine **Douglas-fir beetle:** little change in the short term; increasing risk in the long term due to increasing stocking and increases in presence of larger Douglas-fir **Western spruce budworm:** little change in the short term; long-term increase due to increases in host species and multi-story stands **White pine blister rust:** no change in levels from current condition	**Mountain pine beetle:** 8,506 acres of treatment would reduce risk to remaining pine trees into the long term **Douglas-fir beetle:** 7,172 acres of treatment would reduce risk to Douglas-fir into the long term with a possible small short-term increase in activity due to prescribed burning **Western spruce budworm:** Host species (Engelmann spruce, Douglas-fir, subalpine fir) would be reduced on about 7,172 acres with a shift toward non-host species **White pine blister rust:** rust would not be reduced directly by the treatments, treatments would promote natural regeneration from remaining whitebark pine which may be resistant to the rust and would increase vigor of white pine which have been thinned around reducing the progression of the disease **Dwarf mistletoe:** lodgepole pine dwarf mistletoe would potentially be reduced on about 8,516 acres containing lodgepole with a long-term decrease due to increases in non-host species **Armillaria root rot:** increase in short-term and long-term resistance to the disease where	**Mountain pine beetle:** 6,564 acres of treatment would reduce risk to remaining pine trees into the long-term **Douglas-fir beetle:** 5,203 acres of treatment would reduce risk to Douglas-fir into the long term with a possible small short-term increase due to prescribed burning **Western spruce budworm:** Host species (Engelmann spruce, Douglas-fir, subalpine fir) would be reduced on about 5,288 acres with a shift toward non-host species **White pine blister rust:** rust would not be reduced directly by the treatments, treatments would promote natural regeneration from remaining whitebark pine which may be resistant to the rust and increase vigor of white pine which have been thinned around reducing the progression of the disease **Dwarf mistletoe:** lodgepole pine dwarf mistletoe would potentially be

Alternative 1	Alternative 2	Alternative 3
Dwarf mistletoe: short term no increase from current levels; long-term impacts from lodgepole pine dwarf mistletoe in current infected understory trees **Armillaria root rot:** short-term little change from current condition; long-term increase due to increase in less susceptible species and stocking	found over 8,564 treatment acres	reduced on about 6,564 acres containing lodgepole with a long-term decrease due to increases in non-host species **Armillaria root rot:** increase in short-term and long-term resistance to the disease where found over 6,564 treatment acres

Transportation

Introduction

Vegetation management treatments proposed in the Stonewall project include precommercial thinning, commercial thinning, and regeneration harvest and prescribed burning. The objective is to restore the ecosystem to a historic or natural state or trajectory.

Proposed thinning and regeneration harvest treatments would include removal of material, and would therefore require haul route access. Haul route improvements are the primary topic addressed by this section.

Methodology

Region 1 Timber Strike Team engineers visited the project area and surveyed approximately 75 percent of the project haul routes, documenting improvement needs for haul vehicles and water quality improvements in line with Montana Best Management Practices (BMPs) (Logan 2001). The transportation planner then visited a sample of project roads in September 2010.

Geographic information systems (GIS) tools were used to track and analyze road location, mileage and density within the project area. The HNF Transportation Atlas (Helena National Forest 2011) was used for the analysis, which includes the inventory of routes. On-the-ground reconnaissance was completed on most project routes to observe current conditions and determine needs for short- and long-term treatments.

Incomplete and Unavailable Information

Engineering road surveys and accompanying road logs were completed for approximately 75 percent of the project haul routes. This information and the associated cost estimates were then extrapolated and applied to the remaining 25 percent of unsurveyed roads.

Overview of Issues

Comments pertaining to disclosing the effects of project activities on plants were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition.

Indicators

Indicators used in this analysis to discuss how the alternatives would address the purpose and need for the project are:

- Existing road mileage and road density within the project area
- Proposed activities involving the existing transportation network for project implementation

Affected Environment

Existing Condition

An extensive road network exists within the project area to support community access and management activities of National Forest System (NFS) lands, including mining, grazing, and timber management. The 76.4 miles of existing roads located within the boundary of the Stonewall Project area equates to a road density of approximately 2.04 miles per square mile. The additional 11.3 miles of roads outside the project area are included in the transportation analysis because they connect to and provide access to the project area.

Primary project access routes from Montana State Highway 200 include Forest Roads 626, 1800, 1824 and 4106. Sections of these routes are under Lewis and Clark County jurisdiction and access NFS roads within the project area.

Table 33. Stonewall project area roads summary by jurisdiction

Road Mileage	Jurisdiction
3.3 miles	Private
1.5 miles	State of Montana
4.7 miles	Lewis & Clark County
78.2 miles	Forest Service

Environmental Consequences

The Responsible Official directed the interdisciplinary team that the Stonewall Project minimize changes to the Forest transportation system because the subsequent Route and Area Designation Process will be addressing travel management changes related to motor vehicle use. Therefore, the Stonewall Project transportation activities only accommodate the associated vegetation treatments.

Spatial and Temporal Context for Effects Analysis

Spatial analysis boundaries for transportation systems are limited to 75.6 miles of existing roads within the project area boundary and approximately 11.3 miles of roads outside, but adjacent to and accessing, the project area. A total of 86.9 miles of existing roads would be included in analysis for the Stonewall Vegetation Project.

Analysis timeframes for this project cover the schedule for implementation of the prescribed vegetation and fuels treatment, which is estimated to take up to 10 years from decision date. The proposed transportation system changes for this project are included.

Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The Forest Service would continue to apply recurrent road maintenance for National Forest System roads within the analysis area. Other routes in the analysis area and not on the Forest Transportation System would be maintained by the applicable owner and users. Road surface blading and culvert cleaning are typical annual maintenance tasks. Two existing 48-inch diameter culverts in the project area are scheduled to be replaced under a separate Southwest Crown Collaborative Forest Restoration project effort. These are located on National Forest System Road 4106 at the crossings with Klondike and Theodore Creeks.

Under the Forestwide Hazardous Tree Removal and Fuels Reduction — Healthy Forests Restoration Act Project (USDA Forest Service 2010), danger trees located within approximately 125 feet of open roads would be felled and removed to improve the safety of road users. Associated roads in the Stonewall Project area include National Forest System roads 1800, 1824, 4106, 607, 607-D1, 607-H1 and 626. In addition, treatments would occur to fell and remove danger trees in and adjacent to Pine Grove Campground and the Lincoln Cemetery, and Old Lincoln Townsite Administrative Sites. Haul roads associated with danger tree removal would include varying amounts of maintenance depending on condition of the road and magnitude of project use proposed on the road.

Finally, the Pine Grove Campground would continue to receive use and traffic during the open season from May 15 to November 15 each year.

Alternative 1 – No Action

Direct and Indirect Effects

Under the no action alternative, no changes would be made to the existing transportation network on and adjacent to the project area. Roads would continue to receive use for utilization and administration of NFS lands and access to locations such as Lincoln Gulch, Pine Grove Campground, private mining claims, and southern Scapegoat Wilderness. Roads would be maintained periodically to comply with BMPs. However, roads would not be improved to accommodate safe use of haul vehicles at this time.

Cumulative Effects

Under the no action alternative, there would be no cumulative effects or impacts on the project transportation network.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The no action alternative complies with the HNF Forest Plan and State and Federal law.

Other Relevant Mandatory Disclosures

There are no other disclosures for the Stonewall Vegetation Project.

Summary of Effects

No changes would be made to the existing transportation network on and adjacent to the project area. There would be no cumulative effects or impacts on the project transportation network.

Alternative 2 – Proposed Action

Figure 38 that follows, displays the transportation system for the Stonewall Vegetation Project, alternative 2, by jurisdiction.

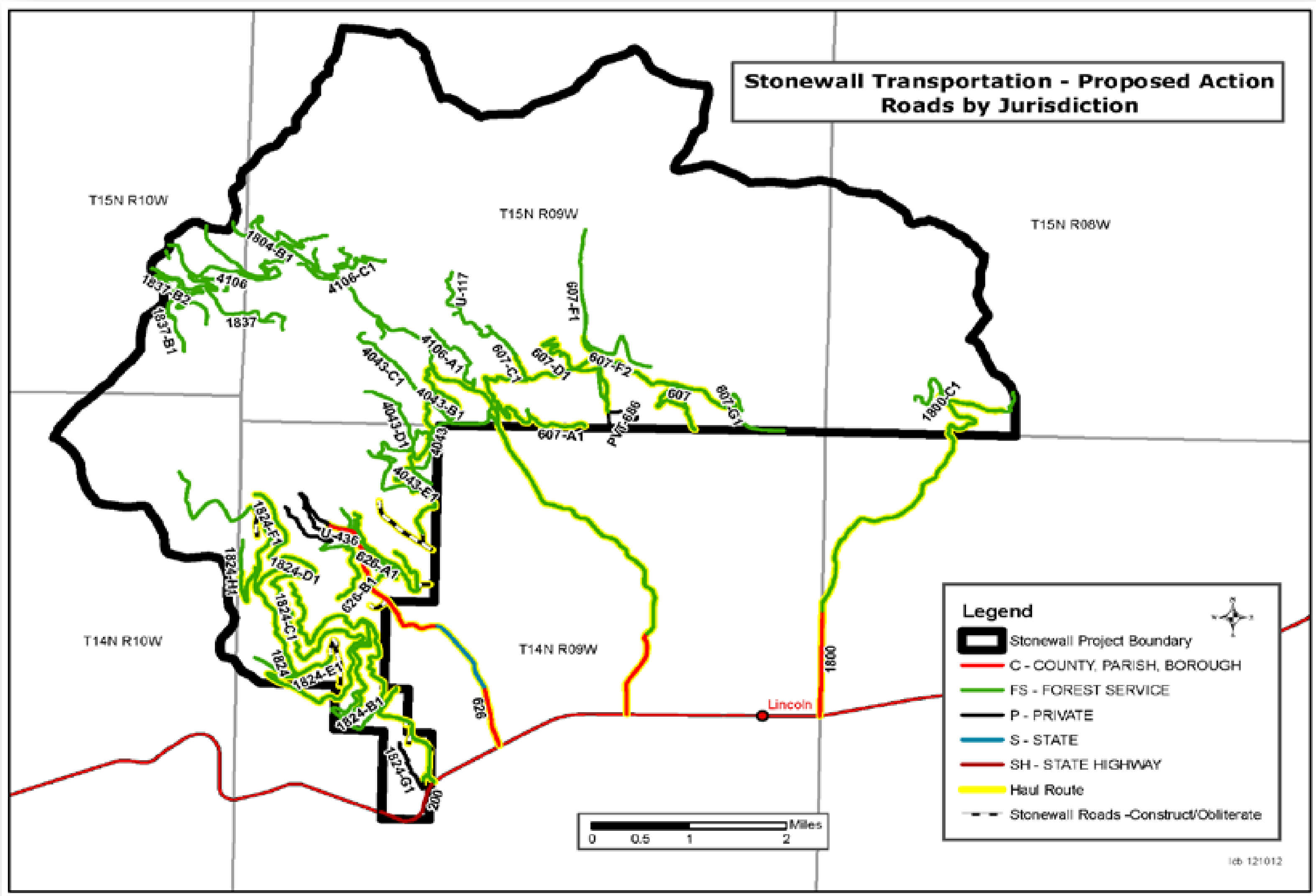

Figure 38. Transportation system for alternative 2-proposed action

Design Features and Mitigation Measures

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to transportation and other resources is displayed in table 9, chapter 2.

The design features in table 9 pertaining to transportation are RDS-1, through RDS-10. This analysis is based on the implementation of all design features. Project design features apply to both action alternatives. Specific design features listed above applicable to transportation are designed to protect other resources such as water and soil.

Direct and Indirect Effects

Under the proposed action, approximately 48.2 miles of roads would access vegetation treatment units and connect with Montana State Highway 200. Nearly 45.6 miles of existing roads would serve as project access and haul routes. Another 2.6 miles of new roads would be constructed to access treatment units. These roads would be closed, obliterated and rehabilitated immediately following vegetation treatments.

Existing road maintenance (45.6 miles) would involve improvement activities in accordance with BMPs, as well as work necessary to accommodate haul vehicles. This work includes the following activities: roadside brushing; surface blading and reconditioning; cleaning, repair, and new installation of drainage structures, including culverts, water bars, and rolling dips; aggregate surfacing; cattle guard cleaning and repair; minor realignment and curve widening to accommodate haul vehicles and trailers; and silt/sediment trap installation.

There are a few roads and road segments (including Forest Roads 626, 1800, 1824, and 4106) not under Forest Service jurisdiction and planned for use as timber haul routes. Before implementation, Forest Service coordination with the appropriate agency or landowner would be necessary in order to acquire the appropriate access and use agreement.

Approximately 2.6 miles of road would be built then obliterated immediately following timber removal, and would involve the minimal construction standard needed to provide short-term haul vehicle and equipment access to treatment units. This road work involves clearing vegetation, grubbing roots and stumps, excavating and shaping a travelled way, and installing drainage structures as necessary to ensure the road properly drains. These roads would be built to the minimum density, cost, and standard necessary for the intended need, user safety, and resource protection. These roads would be closed (e.g., gates, barricades) during operations to limit use to operators only. Intersections with roads would be blocked by rocks, wood or earthen berms, and would be slashed in and/or ripped and covered with slash or seeded within site distance of existing open roads to reduce potential for use after the project activities are completed. There would be no long-term changes to the amount of miles in the permanent road system or open road density in the project area under alternative 2.

Danger trees would be removed on all project roads, approximately 1½ tree lengths (e.g., 125 feet) from the roadway, as needed for safe hauling and project implementation. To provide for public safety, temporary warning and other signing in accordance with Forest Service signing standards would be used during project implementation. Haul routes would also be restricted or temporarily closed to provide for public safety. Existing open routes would be left in a similar condition and drainage structures shall be left in functional condition. Table 34 contains a breakdown of project roads by Helena National Forest LRMP Management Area.

Table 34. Summary of proposed action haul route miles by Forest Plan Management Area

Management Area	Project Haul Route Total Mileage	Roads Built then Obliterated Mileage
M1	2.18	-
T1	7.44	0.89
T2	8.04	-
T3	11.97	0.80
T4	7.24	0.92
Other Lands	11.32	-

See figure 38 for spatial information on the proposed action haul routes

In addition to haul-related work in accordance with BMPs, other additional restoration treatments would occur on project roads.

- A new culvert would be installed where National Forest System Road 626-B1 crosses the tributary to Lincoln Gulch, and a sediment filtering device (i.e., riprap, weed-free straw bales, filter fence, and/or slash filter windrows) would also be included at the crossing outlet.
- A sediment filtering device (i.e., weed-free straw bales, filter fence, bio-logs/waddles, and/or slash filter windrows) would be installed where National Forest System Road 607-E1 parallels Stonewall Creek.

See the separate Transportation Road Work and Costs spreadsheet available in the project record. Also see the Economic Resource Report for more information on project costs.

Cumulative Effects

Under the proposed action alternative, cumulative effects of past, present, and foreseeable actions are expected to have minor impacts on the project transportation network. Project haul routes would be maintained and improved in accordance with BMPs to accommodate haul vehicles. Sediment sites would be mitigated to reduce long-term sediment delivery. Annual road maintenance activities would also occur on National Forest System roads. It is expected that adjacent State and private roads would continue to receive annual maintenance also.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed action complies with the Forest Plan for the Helena National Forest, Forest Service policy, and State and Federal law.

Other Relevant Mandatory Disclosures

There are no other disclosures.

Summary of Effects

See figure 38 for more specific information regarding each road proposed for use during the project. See the separate Transportation Road Work and Costs spreadsheet available in the project record for more specific information about the proposed treatments.

Alternative 3

Figure 39 that follows displays the transportation system for the Stonewall Vegetation Management Project, alternative 3, by jurisdiction.

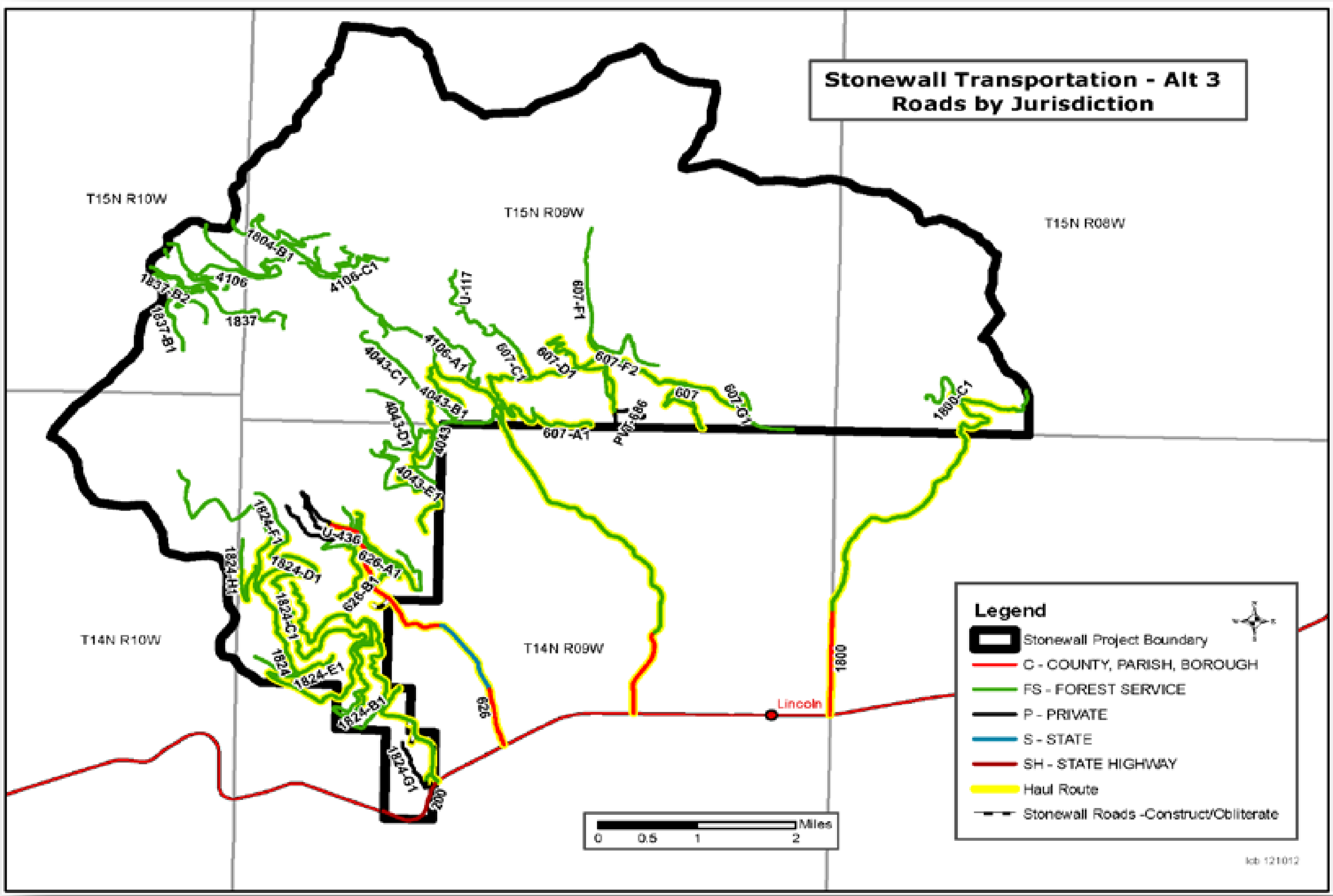

Figure 39. Transportation system for alternative 3

Direct and Indirect Effects

Effects of alternative 3 would be similar to alternative 2, however with slightly fewer miles of road use. Under alternative 3, nearly 44.3 miles of haul routes would be used to access vegetation treatment units and remove material in haul vehicles. Approximately 43.8 miles of existing roads would serve as project access and haul routes. Approximately 0.4 mile of road would be built then obliterated immediately following timber removal; these roads would be closed (e.g., gates, barricades) during operations to limit use to operators only.

Existing road maintenance (43.8 miles) would involve improvement activities in accordance with BMPs necessary to accommodate haul vehicles. This work includes the following activities: roadside brushing; surface blading and reconditioning; cleaning, repair, and new installation of drainage structures including culverts, water bars, and rolling dips; aggregate surfacing; cattleguard cleaning and repair; minor realignment and curve widening to accommodate haul vehicles and trailers; and silt/sediment trap installation.

There are a few roads and road segments (including Forest Roads 626, 1800, 1824, and 4106) not under Forest Service jurisdiction and planned for use as timber haul routes. Before implementation, Forest Service coordination with the appropriate agency or landowner would be necessary in order to acquire the appropriate access and use agreement.

Approximately 0.4 mile of road would be built then obliterated immediately following timber removal, and would involve the minimal construction standard needed to provide short-term haul vehicle and equipment access to treatment units. The construction work involves clearing vegetation, grubbing roots and stumps, excavating and shaping a travelled way, and installing drainage structures as necessary to ensure the road properly drains. These roads would be built to the minimum density, cost, and standard necessary for the intended need, user safety, and resource protection. These roads would be closed (e.g., gates, barricades) during operations to limit use to operators only. Intersections with roads would be blocked by rocks, wood or berms and would be slashed in and/or ripped and covered with slash or seeded within site distance of open roads to reduce potential for use after the project proposed harvest activities are completed. There would be no long-term changes to the amount of miles of permanent road system or open road density in the project area under alternative 3.

Danger trees would be removed on all project roads, approximately 1½ tree lengths from the roadway (e.g., 125 feet), as needed for safe hauling and project implementation. To provide for public safety, temporary warning and other signing in accordance with Forest Service signing standards would be used during project implementation. Haul routes would also be restricted or temporarily closed roads in active project areas to provide for public safety.

Existing open routes would be left in similar condition and drainage structures shall be left in functional condition. Table 35 that follows, contains a breakdown of project roads by Helena National Forest LRMP Management Area.

Table 35. Summary of Alternative 3 haul route miles by Forest Plan Management Area

Management Area	Project Haul Route Total Mileage	Roads Built then Obliterated Mileage
M1	2.18	-
T1	6.03	0.13
T2	8.04	-
T3	10.19	0.10
T4	6.49	0.18
Other Lands	11.32	-

See figure 39 for spatial information on the alternative 3 haul routes.

In addition to haul-related work in accordance with BMPs, other additional restoration treatments would occur on project roads.

- A new culvert would be installed where National Forest System Road 626-B1 crosses the tributary to Lincoln Gulch, and a sediment-filtering device (i.e., riprap, weed-free straw bales, filter fence, and/or slash filter windrows) would also be included at the crossing outlet.
- A sediment-filtering device (i.e., weed-free straw bales, filter fence, bio-logs/waddles, and/or slash filter windrows) would be installed where National Forest System Road 607-E1 parallels Stonewall Creek.

See the Transportation Report (Bielecki 2012) for estimated roadwork items and associated cost estimates. Also see the Economic Resource Report (Lahey 2012) for more information on project costs.

Cumulative Effects

Under alternative 3, cumulative effects of past, present, and foreseeable actions are expected to have minor impacts on the project transportation network. Project haul routes would be maintained and improved in accordance with BMPs to accommodate haul vehicles. Sediment sites would be mitigated to reduce long-term sediment delivery. And annual road maintenance activities would also occur on NFS roads and also on adjacent State and private roads.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 3 complies with the Forest Plan for the Helena National Forest, Forest Service policy, and State and Federal law.

Other Relevant Mandatory Disclosures

There are no other disclosures for the Stonewall Vegetation Project.

Summary of Effects

Figure 39 displays specific location and information regarding each road proposed for use during the project. See the separate Transportation Road Work and Costs spreadsheet available in the project record for more specific information regarding road treatments and costs regarding the roads proposed for the project.

Fire and Fuels

Introduction

Portions of the Stonewall Vegetation Project area are in the wildland urban interface (WUI) identified in the Tri-County Community Wildfire Protection Plan (2005) (figure 44 of this document). The project proposes various prescribed burning treatments on approximately 8,560 acres.

In this section, we discuss the existing condition and provide an overview of the fuels treatments and environmental effects of those treatments by alternative.

Methodology and Limitations

The fuels specialist made a field visit to the project area in 2010 to observe fuel conditions where treatments are being proposed. Fuels data was obtained from unit diagnoses, photos and the 2009 Helena National Forest Eastside Existing Vegetative Map (VMAP). The VMAP data was adjusted by forest personnel in an attempt to show the mountain pine beetle mortality in the project area. The data represents "post kill" data and is assumed to be a time period in the future once the red needles have fallen off the trees. Because of this adjustment, fire modeling of the existing crown fire potential is likely underestimated. Fire behavior fuel models used were derived from Scott and Burgan (2005) as a measure to display general changes in fuel profiles by vegetative cover type. All data was processed through the FlamMap fire behavior model (Finney 2006) to assess the distribution of fire behavior potential in the project area.

Post treatment modeling was also completed for the action alternatives to simulate the effects of the proposed treatments on fuel model and forest canopy characteristics including canopy cover, canopy bulk density, canopy base height, and canopy. The effectiveness of proposed treatments may not be accurately displayed in the modeling because the existing condition data also provided a foundation for modeling the alternatives. Given the uncertainty of any modeling exercise, the results are best used to compare the relative effects of the alternatives, rather than as an indicator of absolute effects (Graham et al. 2004).

Sources of Information

Information sources used for this analysis are listed below and represent some of the best available science obtainable at the time of report completion. There is a large body of literature that makes the case for treating fuels. There is even some controversy about the effectiveness of treatments of forest landscapes to reduce fire hazard. Please see Appendix 6 - Fuel Reduction Science–Selected Discussions from Literature, in the Fire/Fuels Report (Buhl 2015) in the project record for more information regarding treating fuels and ecological restoration science.

- Individual treatment unit diagnosis completed by Helena National Forest personnel and updated in the fall of 2009. These can be found in the project record.
- 30-meter Digital Elevation Model (DEM) Geographic Information Systems (GIS) raster layers from which we attained elevation, percent slope and aspect
- National Agricultural Imagery Program (USDA Farm Service Agency 2011) aerial photo digital imagery.
- Site visits during summer 2010
- GIS spatial data acquired from the Helena National Forest and other sources where noted:
    - VMAP spatial data including classification for tree dominance type, tree canopy cover class, and tree diameter.

- ♦ Helena National Forest Plan (USDA Forest Service 1986) management area boundaries
- ♦ Property ownership boundaries
- ♦ Project area boundary
- ♦ Historic wildfires
- ♦ Past management activities
- ♦ Wildland urban interface classification and boundaries
- ♦ Fire regime condition class (FRCC) data

- Scientific literature
- Other unpublished documents

Assumptions

A number of assumptions are made in this analysis and are listed below:

- ♦ Current Forest Plan and other pertinent management direction would continue indefinitely into the future
- ♦ No major disturbance, such as wildfire, blow down or insect epidemics would occur from the baseline year of 2010 until implementation is completed. This analysis discusses future risk and probable effects if a disturbance occurs. It is not a future projection of the occurrence.
- ♦ Regional Existing Vegetation Mapping Program (VMAP).
- ♦ Helena National Forest VMAP (post kill) PK and Stonewall_g data.
- ♦ The accomplishment time period is estimated to be 2015-2020
- ♦ FlamMap modeling can provide an estimate of the potential fire behavior before and after treatment.
- ♦ The Stonewall Vegetation Project area is sufficient to analyze and discuss effects to the fire and fuels resource.
- ♦ Information contained in the Stone Dry Fuels Report (Kurtz 2009) and the Stone Dry Vegetation Report (Milburn et al. 2006) and can also be applied to the Stonewall Vegetation Project area.

Overview of Issues

The purpose of this project as it relates to the fire and fuels resource includes the following needs:

- Develop a mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects.
- Modify fire behavior to enhance community protection opportunities while creating conditions that allow the reestablishment of fire as a natural process on the landscape.

The issues summarized below were identified from internal and external scoping of the project, and are related to the fire and fuels resource.

Wildland Fire and Homes: Proposed treatments may be inefficient and ineffective in reducing home losses due to fire.

Fire Behavior: Proposed fuels reduction work would not reduce fire behavior.

Prescribed Burning: Concerns over risk of fire escaping burn boundaries during prescribed burning operations.

Measurement Indicators

The measures to assess how well each alternative meets the purpose and need are as follows:

- **Change in potential flame length within the project area -** The Stonewall Vegetation Project includes National Forest System lands adjacent to homes and private property. Desired flame lengths are generally less than 4 feet allowing for safe direct attack by fire crews. Flame lengths greater than 4 feet require deployment of additional resources such as dozers and aircraft. Deploying additional resources increases the time needed to apply successful fire suppression activities. Flame lengths beyond 8 feet increase the likelihood of torching, crowning and spotting. [8]
- **Change in the potential fire type -** Measured as acres of surface fire versus passive crown fire or active crown fire[9], low-severity surface fire allows for safe fire suppression activities as discussed above.

Affected Environment

Existing Condition

The existing condition of the project area has been shaped by decades of wildfire activity (figure 40) and suppression, past silvicultural treatments, fuels reduction and prescribed burning treatments, livestock grazing, noxious weeds, fire wood cutting and recreational activities (appendix C). Barrett et al. (1991) stated that after more than 80 years without fire, dense pole sized under stories of conifers (much of it relatively shade-tolerant Douglas-fir) have developed beneath the partially cut old-growth pine. In many stands in the Douglas-fir and grand fir series in western Montana, long-term fire exclusion, with or without partial cutting has now brought about dense overstocking and large, continuous buildups of fuels, particularly live, ladder fuels that could allow fires to crown and destroy the stand. Fellin (1979) noted the overstocking and shift in composition to more shade-tolerant species might also increase susceptibility to insects and diseases.

Fire Regimes

The natural or historic fire regime is a general classification of the role fire would play across the landscape in the absence of modern human intervention, but including the influence of burning by indigenous people. The natural or historical fire regimes are classified by numbers of years between fires (frequency) and fire severity, which reflects percent replacement on the dominant overstory vegetation. The native fire regime is perhaps the most important ecosystem process altered by fire exclusion (Arno and Brown 1991). The historical fire regimes created shifting mosaics of patches, processes and habitats on the Rocky Mountain landscapes (Agee 1993). Keane et al. (1996) noted that these landscapes tend to become more homogeneous as fire is removed, because succession would eventually advance all stands to similar communities dominated by shade tolerant species. Fires generally become less frequent and more severe with active suppression. Modern wildfires on late-seral landscapes tend to be larger, more intense and more severe because of high biomass loading and multi-layer stand structure. Fires on fire-altered landscapes may burn more area in fewer years, meaning that rare fire years, like 1910, may be especially

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[8] Rothermel, Richard C. 1983 59

[9] **Surface Fire**: Fire that burns loose debris on the surface, which include dead branches, leaves, and low vegetation. Surface fire burns only in the surface fuelbed. **Passive Crown Fire**: consuming single or small groups of trees or bushes. **Active Crown Fire**: The surface fire ignites crowns and the fire spread is able to propagate through the tree canopy.

high in fire activity (Bessie et al. 1995). The increasing numbers of large, severe fires in 1fire-year would make suppression and control increasingly difficult further risking human life and property (Keane 2002).

Fire Regime Condition Class

Fire Regime Condition Class (FRCC) is an interagency, standardized tool for determining the degree of departure from reference condition vegetation, fuels and disturbance regimes (FRCC 2011). FRCC uses various parts of a biophysical setting (BPS)[10] by comparing the current conditions to documented reference conditions; then gives a rating for each BPS based on various factors including succession conditions, fire frequency[11] and fire severity[12]. The three condition classes FRCC uses to describe a BPS departure from reference condition are defined in the following table.

Table 36. The three condition classes as described in FRCC

Condition Class	Description
Low departure (<33%) from reference condition is defined as **Condition Class 1**	Vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability.
Moderate departure (33-66%) from reference condition is defined as **Condition Class 2**	Vegetation composition, structure, and fuels are different from those of the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
High departure (>66%) from reference condition is defined as **Condition Class 3**	Vegetation composition, structure, and fuels are very different from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability.

(Hann and Bunnell, 2001; Hann and Strohm, 2003)

Biophysical Settings

Biophysical Settings (BpS) are land delineations based on the physical setting, (e.g. elevation and aspect) and the potential vegetation community that can occupy the setting. A national team has established in the FRCC system a set of descriptions for BpS found within regions of the United States (FRCC 2005). Helena National Forest ecologists, fuel specialists, and silviculturists reviewed the BpS descriptions applicable to the project area and determined that the descriptions could be used without modification (Milburn et al. 2009). For this analysis area, Helena National Forest personnel spatially assigned BpS based upon habitat type (Milburn et al. 2009). Detailed descriptions for each BpS can be found in project records and a more detailed discussion of each BpS can be found in Milburn et al. (2009).

[10] **Biophysical settings** (Bps) are the primary environmental settings used to determine a landscape's natural fire regime and fire regime condition class (Hann and Bunnell, 2001; Hann and Strohm, 2003

[11] **Fire frequency** is defined as the average number of years between fires or the mean fire interval (Baker and Ehle, 2001; Hann and Bunnell, 2001)

[12] **Fire severity** is defined as the effects of a fire on the vegetation and forest floor, and is measured in terms of surface and overstory fuel consumption and heat transference to the organic and mineral soil (DeBano et al. 1998).

The FRCC analysis was completed for the project area (Olsen 2010) including updates to the BpS classification. Data from that analysis was used for the Stonewall project and is summarized in the following sections.

Table 37 that follows, shows the current departure from reference condition for each biophysical setting located in the Stonewall Project area. The analysis shows fire frequency and fire severity are outside of the reference condition for the majority of the biophysical settings. The moderate and high departure ratings are of most concern and it is probable these areas would continue to move further from reference condition without management or fire disturbance. Refer to the FRCC NFMA Analysis (Olsen 2010) or the Silviculture Report (Amell and Klug 2015) for more information on biophysical settings.

Table 37. Current FRCC Rating for Biophysical Settings in Stonewall Project Area

Biophysical Setting	Percent Of Area	Fire Regime Condition Class Rating	Fire Frequency Severity Rating
	STONEWALL PROJECT AREA	**CURRENT CONDITION**	**CURRENT CONDITION**
Ponderosa Pine Douglas-Fir (Ppdf1)	32%	High (99%)	High (71%)
Douglas-Fir Warm (DFIR2-D)	23%	High (84%)	Mod (60%)
Douglas-Fir Cool (DFIR2-M)	24%	Mod (47%)	Mod (47%)
Lower Subalpine Fir (SPFI1)	13%	Mod (52%)	Low (12%)
Upper Subalpine Fir (SPFI2)	2%	Low (33%)	Low (24%)
Mountain Grasslands (MGRA3)	6%	Low (25%)	Low (25%)

Carbon Storage

The entire Atmospheric Carbon Report may be found in the project file (Amell and Klug 2013). Changes to atmospheric carbon release or storage resulting from the proposed activities for the action alternatives correspond to changes in forest vegetation cover and condition. The predicted effects of the proposed alternatives are described in qualitative and relative terms, as opposed to a quantitative analysis. The scale of carbon storage or release from the Stonewall Project is so minor relative to the scale of global or U.S. carbon storage and greenhouse gases (GHG) release that discussing the effects in detail would be meaningless.

Milburn et al. (2006) and the Stonewall Silviculture Report (Amell and Klug 2015) note forests in the Stonewall area have become denser, and late-seral fire-intolerant tree species have increased as a result of fire exclusion. Along with these changes there may have been an increase in stored carbon, however without a detailed and quantified analysis we are speculating. Fellows and Goulden (2008) found that carbon storage decreased with forest thickening due to increased mortality of large trees. Also, a substantial portion of the overstory and mid-story pine trees have recently been killed by mountain pine beetles and are no longer storing carbon, but have become sources for GHG. As the trees decay, GHG release would be relatively slow, but if and when wildfires burn in these stands a large portion of the decaying wood would be consumed (Skinner 2002, Knapp et al. 2005) and the carbon abruptly released. The recent mortality has most likely resulted in many stands now being sources of GHG rather than sinks. In the long term, as stands fill in and trees grow larger, the rate at which carbon is being stored would increase and the stands would eventually again become sinks rather than sources.

Due to increases in fire-intolerant trees and stand densities, future fires are anticipated to cause a great deal of mortality. This means the currently stored carbon would become relatively unstable with a high likelihood of such stands converting carbon sinks to sources for GHG emissions.

The general effects of activities proposed for the action alternatives would be similar and so we discuss them together; the major difference between the two alternatives being acres of area treated. About 8,564 acres would be treated under alternative 2 and 6,564 acres would be treated under alternative 3 within the 24,000-acre project area. Both alternatives comprise a variety of treatments including prescribed burning, live tree thinning with removal and fuels treatments, and dead tree cutting with removal and fuels treatments.

The immediate direct and indirect effects of the action alternatives to atmospheric carbon would be a combination of results involving storage on-site, storage off-site, and release to the atmosphere. The net result would be less carbon stored within the forest. Carbon in treated units would be:

- Retained on site as live trees
- Retained on site as dead standing trees (snags) or coarse woody debris to be relatively slowly released to the atmosphere
- Removed from the forest for use in harvested wood products—which would be considered off-site storage
- Removed from the forest for burning as residential or industrial heat, or to produce electricity, which could be considered to be replacing the GHG emissions from fossil fuels
- Released to the atmosphere through prescribed burning, either directly through consumption or through killing small trees and making them sources rather than sinks

Activities proposed for the action alternatives would increase the stability of stored carbon in treated stands and on the landscape by pushing the stands toward dominance by early seral and fire-tolerant tree species. Activities are designed to create more of a mosaic of stand ages and structures on the landscape, which would decrease stand-level and landscape-level fire intensity and severity (Buhl 2015).

Carbon storage decreased in the project area due to the recent mountain pine beetle epidemic. Succession has resulted in denser stands of smaller average diameters, and a greater proportion of fire-intolerant trees. Although a high level of carbon is stored in the forests relative to what the site and forest types are capable of, the carbon is unstable due to susceptibility of stands and the landscape to severe wildfires. Alternative 1 would not change the condition. Alternatives 2 and 3 would result in some carbon being removed from the forest for storage elsewhere and some carbon being released. Due to the nature of the treatments and the small area treated, most of the carbon contained in live trees in the project area would remain on site. The affected forest lands in this proposal would remain forests, not converted to other land uses, and long-term forest services and benefits would be maintained. Stored carbon in treated stands and over the landscape would be more resistant to wildfires and so more stable in the long term.

Fire Frequency and Severity

A brief description of the reference fire frequency and fire severity for each biophysical setting in the Stonewall Project area as rated by FRCC is discussed below (Milburn et al. 2006) and displayed in table 38.

Ponderosa Pine Douglas-Fir (Ppdf1)

The reference fire frequency for this setting was a 22-year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of over story mortality that would occur in a wildfire, was 24 percent while the current severity is 70 percent. Fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Douglas-Fir Warm (DFIR2-D)

The reference fire frequency for this setting was a 30-year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of over story mortality that would occur in a wildfire, was 10 percent while the current severity is 70 percent. Fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Douglas-Fir Cool (DFIR2-M)

The reference fire frequency for this setting was a 30-year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 10 percent while the current severity is 70 percent. Fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Lower Subalpine Fir (SPFI1)

The reference fire frequency for this setting was a 111-year mean fire interval; the current frequency is 140 years. The reference severity, which represents the amount of over story mortality that would occur in a wildfire, was 67 percent while the current severity is 75 percent. Frequency and severity are not substantially different from reference conditions. A wildfire would not behave uncharacteristically due to those factors. The disparity of the vegetation fuel classes to the reference composition would likely cause greater over story mortality than under reference composition.

Upper Subalpine Fir (SPFI2)

The reference fire frequency for this setting was a 143-year mean fire interval; the current frequency is 140 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, is 57 percent while the current severity is 70 percent. The fire return interval is not different from the reference but the amount of tree mortality from a wildfire would be greater than what would be expected under reference conditions.

Mountain Grassland with Shrubs (MGRA3)

Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. While this setting would likely benefit from fire, it is characteristic of reference conditions.

Table 38. Fire frequency and severity by biophysical settings in the Stonewall Project area

Biophysical Setting	Reference Fire Frequency (MFI)*	Current Fire Frequency	Reference Fire Severity (%)	Current Fire Severity (%)
Ponderosa Pine Douglas-Fir (Ppdf1)	22 MFI	70 years	24%	70%
Douglas-Fir Warm (DFIR2-D)	30 MFI	70 years	10%	70%
Douglas-Fir Cool (DFIR2-M)	30 MFI	70 years	10%	70%
Lower Subalpine Fir (SPFI1)	111 MFI	140 years	67%	75%

Biophysical Setting	Reference Fire Frequency (MFI)*	Current Fire Frequency	Reference Fire Severity (%)	Current Fire Severity (%)
Upper Subalpine Fir (SPFI2)	143 MFI	140 years	57%	70%
Mountain Grassland with Shrubs (MGRA3)	Characteristic of reference condition	Characteristic of reference condition	Characteristic of reference condition	Characteristic of reference condition

*Mean Fire Interval (MFI)-An arithmetical index of fire frequency, expressed as the average number of fire intervals within a given time period (Firewords.net)

Fire History and Occurrence

Fire has been the major influence on vegetation patterns, composition, structure, function, age and development of both individual stands and the larger landscape (Arno 2000). Fire history data from the Interior Columbia Basin Ecosystem Management Project region (ICBEMP), which includes the Stonewall Project area, suggest that extensive fire activity occurred at least every ten to twenty years between the mid-1500s and the early 1900s (Barrett et al. 1997). Agee (1993) added that changing land use patterns and attempts to exclude fire have succeeded in greatly reducing the scope of fire on the landscape.

In the Stonewall area, 66 fires were reported from 1920 until 2011. Although many fires had no accompanying written information and therefore were not included in fire occurrence maps, this data does give a glimpse of the fire suppression history in the Stonewall area. Fires that escaped detection would not be included. The fire occurrence data was digitized as point source data from historical maps that portrayed fires by year, size class, and cause for 1920 to 1969. For the period from 1970 to 2009, fire occurrence information was developed from Kansas City fire database (KCFast). The records from this period have detailed information including acreage, cost, and physical location. The Snow/Talon fire burned 36,012 acres adjacent to the project area in 2003. The Keep Cool Fire burned 302 acres at the edge of the project area in 2006 and cost approximately one million dollars to suppress. In 2007, the Bull Mountain Fire burned 30 acres. In 2011, the Lone Point fire burned 3 acres within the Stonewall project area. In addition, the Porcupine fire burned 133 acres and the Arrastra Fire burned 472 acres, both within 1.5 miles of the project area.

The NFMA report (Kurtz 2009) includes the fire history within all ownerships in the Stone Dry watershed area, which includes the Stonewall project area. This report noted 188 fires were reported from 1920 through 2009. For 1920 to 1969, approximately 1,243 acres on all ownerships burned and during the period from 1970 to 2009, 125 fires burned approximately 531 acres within the watershed area. Therefore, no more than 1,774 acres or less than 4 percent of the project area has burned across all ownerships since 1920. Acreage for fire size classes are as follows: (A) less than 0.25 acres, (B) 0.26-9.9 acres, (C) 10-99 acres, (D) 100 – 299 acres, (E) 300-999, (F) greater than 1,000 acres.

Table 39 shows the fires per decade by size class within the Stonewall Project area. Acreage for fire size classes are as follows: (A) less than 0.25 acres, (B) 0.26-9.9 acres, (C) 10-99 acres, (D) 100 – 299 acres, (E) 300-999, (F) greater than 1,000 acres. Figure 40 spatially displays the fire history of the project area.

Table 39. Number of fires in the Stonewall Project area per decade by size class

DECADE	A	B	C	D	E	TOTAL
1920-1929	1					**1**
1930-1939	6	1				**7**
1940-1949	5					**5**
1950-1959	4	1	1			**6**
1960-1969	6		1			**7**
1970-1979	6	3	1			**10**
1980-1989	5	3	1			**9**
1990-1999	7	3		1		**11**
2000-2009	5	3			1	**9**
2010-Current		1				1
Total	**45**	**15**	**4**	**1**	**1**	**66**

Source: Stonewall_PrjBdyFirepts_092111.xlsx

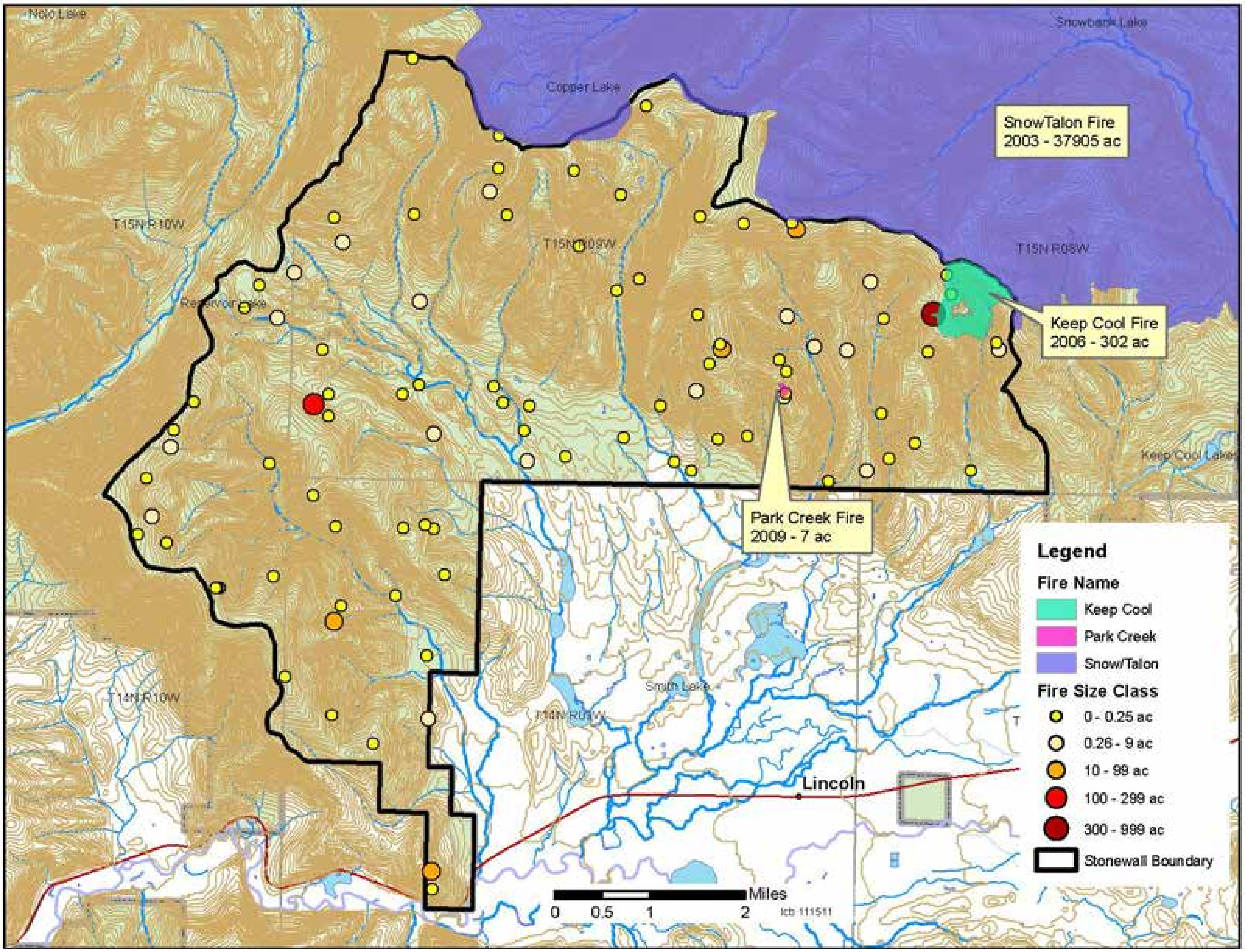

Figure 40. Fire History Map of the Stonewall Project Area

Fire Behavior and Fuel Condition

Fire behavior is driven by the combination of fuels, topography, and weather across the landscape. Surface fires spread according to the direction and speed of wind and the steepness of a slope. Passive crown fire encompasses a wide range of fire behavior from individual trees torching to nearly active crown fire. Active crown fire spreads rapidly and involves surface and canopy fuels and spreads from tree to tree through the canopy. Crown fires are more difficult to control and have more severe effects compared to a surface fire due to higher rates of spread, increased fire intensity, and increased probability of spot fires igniting ahead of the fire front. Fuel conditions exist in the project area that could contribute to high-intensity fire adjacent to private land.

Treatments that decrease surface, ladder and canopy fuels[13] generally make the area more resistant to stand-replacing wildfires. Keane and others (2002) state that since the early 1930s, fire suppression programs in the United States and Canada successfully reduced the amount of wildland fires in many Rocky Mountain ecosystems. This lack of fires within many forest and range landscapes has resulted in atypical accumulations of fuels that pose a hazard to many ecosystem characteristics.

A fire behavior fuel model represents the fuelbed characteristics necessary to predict surface fire behavior in fire behavior modeling systems. In 2005, Scott and Burgan presented a new set of fire behavior fuel models that expanded on the original 13 created by Anderson in 1982. Advantages of this new set include: increased precision in surface fire intensity prediction and subsequent crown fire behavior prediction, increased ability to simulate changes in fire behavior as a result of fuel treatments, and improved accuracy of fire behavior predictions outside of the severe period of the fire season (Scott and Burgan 2005). For these reasons the Scott and Burgan models are used in the fire behavior modeling systems used in this analysis. The distribution of fuel models mapped in the Stonewall project area is shown in table 40.

Thirty-two percent of the project area is mapped as fuel model TU1 which depicts a combination of forest litter[14] and a low load of grass and shrub fuel as the primary carrier of fire. Fuel model TU5 comprises 24 percent of the area. The primary carrier of fire in fuel model TU5 is heavy forest litter with a shrub or small tree understory which can likely lead to crown fire due to the abundance of ladder fuels (figure 41).

Fuel model TL5 comprises 27 percent of the project area. The primary carrier of fire in TL5 is a high load of conifer litter, slash and mortality fuel. Although fire behavior is relatively low in TL5 this fuel model also includes downed logs which can increase resistance to control by firefighters. With concentrations of dead fuels, individual trees or groups of trees may torch, and fire may continue through the crowns aided by high winds. Fuel model TL3 comprises 9 percent of the project area and consists of a moderate load of conifer litter. Flame lengths and spread rate are typically low with TL3. Five percent of the non-forested fuel models within the project area are mapped as GR1. The flame length and rate of spread in GR1 is low compared to other grass fuel models and is primarily used to represent the grassland areas.

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[13] *Surface fuel* is defined as fuel lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material downed logs, bark, tree cones, and living plants of low stature. *Ladder fuels* are defined as fuel that provides vertical continuity between surface fuel and canopy fuel strata, increasing the likelihood that fire will carry from surface fuel into the crowns of shrubs and trees. *Canopy fuels* are the foliage and fine branchwood of trees. (Scott 2008)

[14] Litter is defined as leaves, needles, fine twigs, and other organic material on the forest or grassland floor that have undergone little or no decomposition.

Figure 41. Photo showing understory ladder fuel component combined with overstory conifers

Table 40 Current distribution of fire behavior fuel models in the project area.

Fuel Model Code	Description	Acres	% Of Total
GR1 (101)	Short, sparse dry climate grass	1,243	5
GR2(102)	Low load, dry climate grass	295	1
GS2 (122)	Moderate load, dry climate grass-shrub	83	<1
TU1(161)	Low load, dry climate timber-grass-shrub	7,734	32
TU5(165)	Very high load, dry climate timber-shrub	5,669	24
TL3 (183)	Moderate load conifer litter	2,215	9
TL4(184)	Small downed logs	11	<1
TL5 (185)	High load conifer litter	6,568	27
TL7(187)	Large downed logs	31	<1
TL8 (188)	Long needle litter	147	<1

A current risk to a significant portion of the landscape in the project area is a stand-replacing fire event such as the one that occurred in 1988 during the Canyon Creek Fire[15] in the Scapegoat Wilderness, and in 2003 during the Snow-Talon Fire in the Copper Creek drainage northeast of Lincoln. The project area has

[15] The Canyon Creek Fire burned 247,000 acres of which approximately 160,000 acres burned in a single burning period, the largest ever recorded.

similar fuel types and weather patterns (table 42) that support the risk of stand-replacing fire. Other reasons include, (1) fire suppression within the Stone Dry area has been quite effective since records were kept in 1920, (2) the removal of fire as an important process has affected the current fire regime, (fire interval and fire severity), and (3) a substantial number of stands have been classified as mid- and late-seral closed canopy. The location of the town of Lincoln and the surrounding community is a concern for large wildfire in the project area, as north/northwest winds are common with cold fronts that would push a fire towards the community (Kurtz 2009).

A visual indicator of fireline intensity is flame length (Rothermel 1983). Flame length is widely used as a means to relate visible fire characteristics and interpret general suppression strategies. These flame-length classes and interpretations are familiar to fire managers and are widely accepted as an intuitive communications tool. Table 41 compares fireline intensity, flame length, and fire suppression difficulty interpretations.

Table 41. Fireline intensity interpretations

Fireline Intensity	Flame Length	Interpretations
Low	Less than 4 feet	Direct attack at the head and flanks with hand crews; hand lines should stop spread of fire
Moderate	4-8 feet	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to stop fire spread. Equipment such as dozers, engines, and retardant aircraft can be effective.
High	8-11 feet	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the fire head are likely ineffective. This fire would require indirect attack methods
Very High	> 11 feet	Crowning, spotting, and major fire runs are probable; control efforts at the head are likely ineffective. This fire would require indirect attack methods

Table based on Rothermel (1983)

Geospatial fire modeling was used to evaluate the flame length and crown fire potential within the project area under a weather scenario conducive to high fire behavior on the Helena NF. Weather conditions that occurred during the Snow Talon Fire in 2003 were used for this scenario. The modeling was conducted for current and future scenarios under the proposed alternatives. The current condition results are summarized for the project in table 42 and visually displayed in figure 42.

Table 42. Potential fire behavior characteristics modeled with 25 mph upslope 20-foot winds.

Potential Fire Behavior Characteristic		Percent [A]
Flame Length	Less than 4 feet	32
	Greater than 4 feet	68
Fire Type	Surface Fire	65
	Crown Fire	35

[a] -Percent of burnable acres- Non-burnable acres are not shown in table

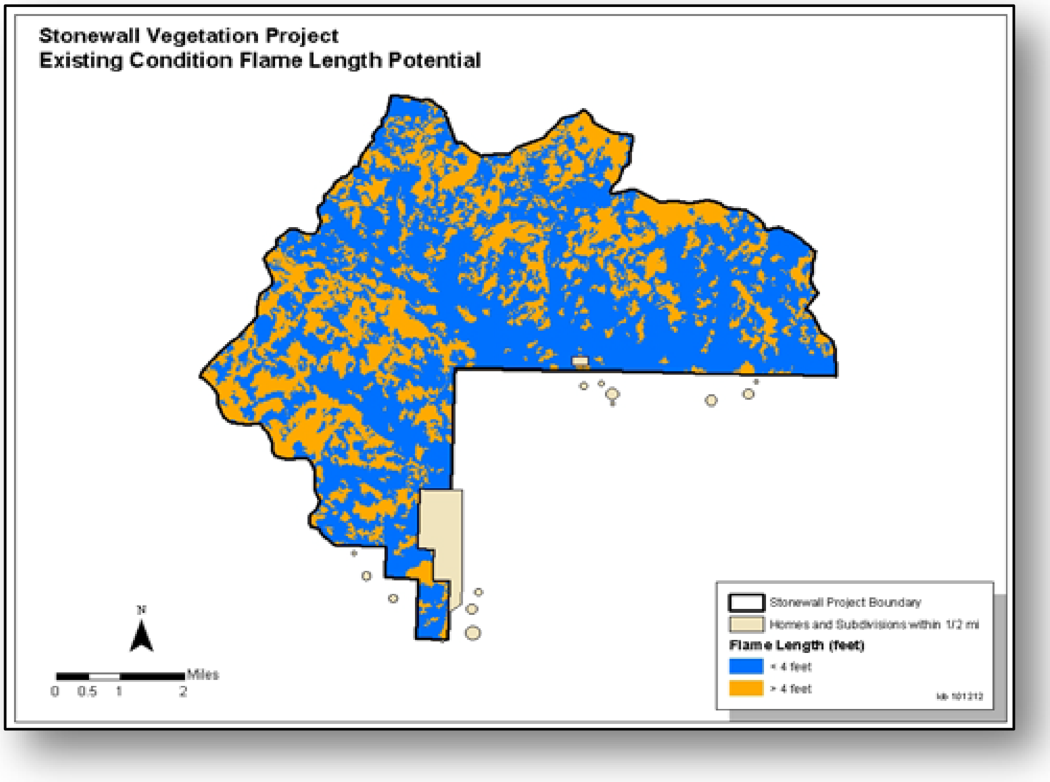

Figure 42. Existing condition fire behavior potential displayed as flame length

As shown in table 42, modeling suggests that 68 percent of the project area has potential fire behavior characteristics that would make direct suppression strategies ineffective or unsafe for firefighters. Portions of the project area exhibiting these conditions are of concern due to the proximity of private land. Conditions like these can lead to high acreage burned and significant adverse effects on resources.

Local fire managers state that significant fire spread on the HNF is generally due to spotting and wind-driven crown fires. The Snow Talon Fire in 2003 was an example of this type of fire behavior. In one afternoon the fire grew 20,000 acres due to heated fuels and the alignment of westerly winds as noted by Studebaker's Incident Management Team in the Lincoln Complex Operations Narrative (USDA 2003). Areas expected to experience crown fire have the potential for spotting. Figure 43 shows the areas that have the highest potential for crown fire in the project area. Fires initiating within these areas have the potential to spread through spotting and threaten private land adjacent to the project area.

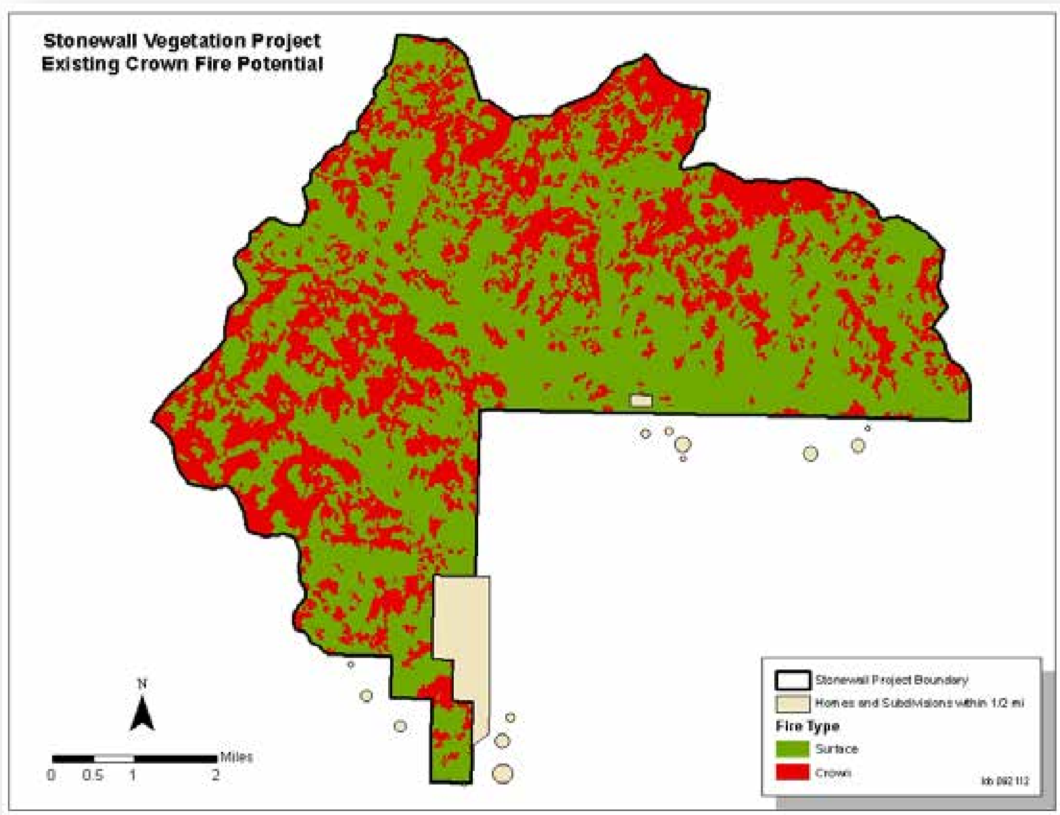

Figure 43. Existing condition fire behavior potential displayed by fire type

Wildland Urban Interface

The Tri-County Fire Working Group, which is composed of representatives from Broadwater, Jefferson and Lewis and Clark counties, developed the Regional Community Wildfire Protection Plan (CWPP 2010). Membership of the group includes individual citizens, local government, state and federal agencies, interested contractors and fire suppression departments. The CWPP identifies goals and objectives for mitigating wildland fire hazard. Some of the objectives are:

- Propose and implement projects to protect communities at risk from wildfire.
- Focus first on the wildland urban interface communities at risk.
- Encourage the Federal and State agencies to continue creating fire defensible space around homes that border agency land.

The CWPP defined the wildland-urban interface (WUI) as, "… the area within 4 miles from interface communities that possess a population density exceeding 250 people per square mile" (CWPP 2005). WUI boundaries were defined utilizing input from local residents, available GIS technology, known fuel hazards and fire history of the area, local topographic features, weather patterns and understanding the fire response and suppression capabilities in the area. Proposed projects in the WUI would become a priority for accomplishment and would be assigned a numerical value of risk based on the existing fuel hazard, number of people in the immediate area and past history of wildland fires starting in the immediate area. Lincoln, Montana is identified as a “Community-at-Risk” in the Federal Register (CWPP 2005). The Fire Ignition Probability map showed the area surrounding Lincoln, including the Stonewall project area, as a moderate to high occurrence of fire starts based on the data years of 1990-2000. Portions of the Stonewall Project area are ranked as high to very high with regard to fuel hazard rating. These areas represent the potential for high intensity crown fires with extreme rates of spread.

Thirty-nine percent of the Stonewall project area is classified as wildland-urban interface. The CWPP further identifies the Stonewall project as a priority fuel hazard reduction project. The decision maker considered treatments recommended by the Lincoln Restoration Committee, along with treatments identified by forest specialists that would move towards Forest Plan goals for fuel reduction and increase habitat diversity for associated wildlife species.

Table 43 that follows displays the wildland-urban interface classifications within the Stonewall Vegetation Project area, approximate acres that lie within each classification and the proportion of the project area represented by each classification. Figure 44 shows spatially the WUI classifications within the project area.

Table 43. Wildland Urban Interface classifications within Stonewall Project area

Wui Classification	Acres	Proportion Of Project Area (%)
Outside WUI Zone	11,452	48
Low Risk	7,785	32
Moderate Risk	2,087	9
High Risk	1,502	6
Very High Risk	1,180	5
Total	**24,006**	**100**

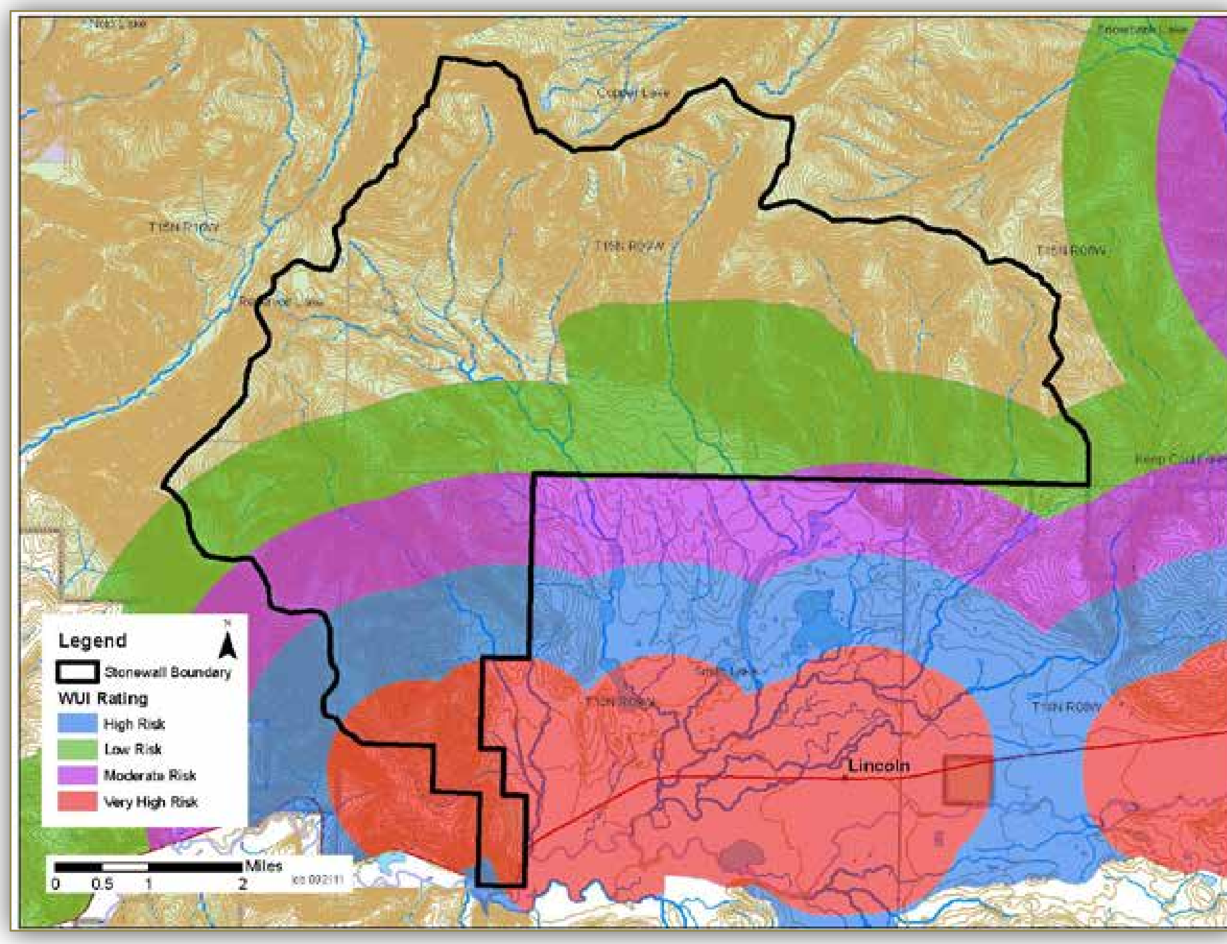

Figure 44. Fire risk ratings for Wildland Urban Interface within the Stonewall Project boundary

Environmental Consequences

Spatial and Temporal Context for Effects Analysis

Spatial Bounds: The spatial scale for effects analysis is dependent upon the measurement indicator and focused within the Stonewall project area boundary to assess treatment effectiveness in reducing fire behavior.

Temporal Bounds: The year 2010 is the baseline used for the existing condition and this analysis. It is estimated proposed treatments would be completed in approximately 10 years. Re-entry into the units for maintenance prescribed burning is desired to maintain treatment effectiveness and to continue restoration efforts.

Past, Present, and Foreseeable Activities and Connected Actions Relevant to Cumulative Effects Analysis.

Direct, indirect and cumulative effects for the fire and fuels resource consider the impacts of the alternatives when combined with fuel profile changes resulting from other activities including silvicultural treatments, wildfires and fuels reduction activities. These actions contributing to cumulative effects were selected because they have caused or have the potential to cause changes in fire behavior.

Past Activities

Past activities that have shaped the existing condition of the project area include wildfire, fire suppression, prescribed burning and other fuels reduction activities, silvicultural treatments and insect and disease activity. Previous fire (table 39) and fuels reduction or prescribed burning activities have influenced the project area. From 1950-present there has been approximately 7,922 acres[16] treated within the Stonewall project area. There have also been approximately 5,067 [17]acres of silvicultural treatments from 1950 to the present (Amell and Higgins 2014). Other past actions including livestock grazing, fire wood cutting, noxious weed treatment and recreational activities generally had a small or localized effect on fuels in the project area and have been considered in describing the current condition.

Current and Future Activities

Current and future activities predicted to influence the fire and fuels resource include a Forestwide hazard tree removal and fuels reduction project. This project involves removing hazardous trees up to 175 feet from the edge of road rights-of-way. This treatment would overlap portions of treatment units under the proposed action.

Connected Actions

Connected actions are considered necessary in order to implement proposed treatments. Fire control lines are a connected action to the fuels resource and are proposed with this project.

Prior to prescribed burning it may be determined control lines are needed to assure prescribed fire remains within designated unit boundaries. Control lines are defined as, “all constructed or natural fire barriers and treated fire edges used to control a fire” (NWCG 1994). This includes but is not limited to the following: black line, hand line, pruning, mowing, saw line and hose-lays. Control lines would occur along existing trails and ridgelines or in areas of thinner vegetation when feasible.

Alternative 1 – No Action

Direct Effects

There would be no direct effect to fuels under this alternative. The no-action alternative would not alter the fuel profile to reduce fire behavior and would not meet the purpose and need of this project. Potential fire behavior characteristics would be similar to those described under the existing condition and summarized in table 42. In the absence of human-caused or natural disturbance such as vegetation treatment activities and wildfire, there may be an increased accumulation of surface and ladder fuels due to insect and disease activity, blow down and the progression of forest succession.

Indirect Effects

Over time, the no-action alternative would indirectly lead to increased surface, ladder and crown fuels that affect flame length, contribute to the torching of trees, and make crown fire more likely (Peterson et al. 2005, Graham 2004). Increases in fuel loading would make overstory trees more susceptible to damage from wildfire. It is probable the fire-tolerant trees would continue to be replaced by trees that are less fire tolerant and therefore less resistant to stand-replacing fires. Wildfires that escape initial attack may impact adjacent private lands and other resource values. It is probable that another large wildfire, like the Snow

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[16] The number of acres treated may also include overlap from areas that have been re-treated over the decades.
[17] The number of acres treated may also include overlap from areas that have been re-treated over the decades.

Talon fire, may threaten adjacent private lands. Direct suppression tactics by firefighting forces would not be as effective in the project area under the no-action alternative as compared with the results of the treatments proposed for the action alternatives. The no action alternative would restrict local fire managers from utilizing fire for meeting various land management objectives. Fire suppression activities would continue in the project area. Case studies of watersheds in two national parks in California found the impacts of suppression on fire return interval departure (FRID) were substantial. The results showed if all ignitions were allowed to burn, the fire return interval would have improved from a high departure rating to a low departure rating in one of the study areas. The author noted the consequences of suppressing fires included substantial impacts to the fire return interval which may have a substantial impact on an entire ecosystem (Miller 2012).

Average snag numbers were shown to exceed Forest Plan standards in all tree size classes without taking into account mortality in the years 2009 and 2010 (Amell and Higgins 2014). It was estimated snags greater than or equal to 7 inches d.b.h. ranged from 47-49 tons per acre, which is approximately 25 times the Forest Plan required level. Tree mortality, as a result of insect and disease activity and natural forest succession, would continue into the future and would exacerbate the amount of standing and downed fuels in the project area and adjacent to private land. These unprecedented fuel levels have the potential to significantly affect fire behavior should another wildland fire occur within or adjacent to the project area.

Cumulative Effects

Present or reasonably foreseeable future fuels reduction and vegetation management projects in the areas would complement other federal and private fuel reduction treatments that have occurred or are occurring by collectively reducing fire behavior (flame length and crown fire potential) within the areas they are applied by removing surface, ladder and crown fuels. Public firewood cutting has occurred in the project area and would continue into the future having a localized effect on fuels.

The Helena National Forest’s has begun implementing the “Forest-Wide Hazardous Tree Removal & Fuels Reduction Project” (USDA Forest Service 2010). This project would remove hazardous trees within National Forest System roads rights-of-way and around administrative sites. The Stonewall Project area would benefit from this project due to a reduction in fuel loading once the activity fuel loading levels are reduced. Removing standing dead and down fuels in road rights-of-ways would provide safe areas for firefighters to initiate fire suppression activities. It is also expected that these areas would improve fire line construction efficiency.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The no-action alternative would fail to achieve goals set forth in the National Fire Plan and would not comply with the Helena National Forest Land and Resource Management Plan direction. In addition, the no-action alternative would be unresponsive to the Tri-County Community Wildfire Protection Plan (2010), as well as the Lincoln Restoration Committee and Montana Forest Restoration Committee’s recommendations.

Alternative 2 and Alternative 3

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the treatments proposed for the action alternatives described in this section, design features would be implemented where applicable. A description of the project design features relating to fire and fuels and other resources is displayed in table 9, chapter 2.

The design features in table 9 pertaining to fire and fuels are FUEL-1 through FUEL-8. This analysis is based on the implementation of all design features. Project design features apply to both action alternatives. Specific design features listed above that are applicable to fire and fuels are designed to protect other resources such as water and soil.

Alternative 2 - Proposed Action, Treatment Descriptions

Group 1: This group includes 18 treatment units comprising about 974 acres. Treatment objectives for this group are to develop mature, open forests comprised mostly of fire-resistant species. The proposed treatments would thin live trees, remove dead trees, and prescribe burn surface fuels. All tree thinning would be "from below" to favor retaining larger trees over smaller trees except that thinning regimes would favor retaining smaller trees of a more desirable species over larger trees of a less desirable species, and would favor keeping smaller, healthier and disease-free trees over larger, diseased trees. In general, the species preference for retention would be aspen, western larch, ponderosa pine, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir in descending order. This general order of preference may be modified for individual stands to address management objectives such as retaining species diversity, site factors, and other stand-specific factors such as relative species presence as noted in individual stand/unit prescriptions.

Trees would be thinned to an average spacing of 20 to 40 feet (109 to 27 TPA), but spacing could vary widely. Thinning would be by hand or machine.

All cut, live trees of a merchantable size would be removed for utilization. All merchantable dead trees would be removed, except those needed to meet other resource concerns (e.g., snag and downed large woody debris requirements).

The thinning and removal units that follow would be underburned or jackpot burned to reduce fuels.

Group 2: This group includes 25 treatment units comprising about 1,132 acres. Treatments would thin small-diameter trees of little to no merchantable value. The thinning regime would generally be as described above for Group 1, except that post-thinning average tree spacing would range from 12 to 20 feet (109 to 303 TPA). Thinning would be by hand and/or machine, depending upon tree size. In several units, thinning slash would be piled by hand and burned.

Group 3: This group includes 19 treatment units comprising about 745 acres. Treatments proposed are seedtree and shelterwood harvest/regeneration systems (appendix B). Most trees, except as needed for shelter and seed production would be removed. In some of the shelterwood treatments, trees would be retained in groups; in others the remaining trees would be relatively evenly distributed. All cut, live trees of a merchantable size would be removed for utilization. All merchantable dead trees would be removed, except those needed to meet other resource concerns (e.g., snag and downed large woody debris requirements). Many of the units would be burned to reduce fuel loads and prepare sites for natural regeneration or planting. Many of the units may be planted with some combination of ponderosa pine, Douglas-fir, and western larch where needed to regenerate the stands to the desired seral and fire-resistant species.

Group 4: This group includes 11 treatment units comprising about 223 acres. Treatments proposed are clearcut harvest/regeneration systems in which all trees would be removed except for scattered clumps or individuals. Retained trees would mostly be Douglas-fir, ponderosa pine, or western larch. All live and dead merchantable trees would be removed for utilization. Following cutting and removal, units would be prescribe burned, the type of burn varying by individual unit fuels reduction and site preparation treatment need. Natural regeneration by Douglas-fir and lodgepole pine is expected to occur to some degree and Douglas-fir, ponderosa pine, and western larch may be planted, the mixture differing by individual unit.

Group 5: This group includes two treatment units comprising about 25 acres. The treatments would remove dead and dying trees, slash non-commercial-sized trees, and reduce fuels by handpiling and burning. All cut merchantable trees would be removed for utilization using ground-based equipment except as needed to meet other resource concerns.

Group 6: This group includes three treatment units comprising about 449 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. The prescribed burning would create openings less than 5 or 10 acres, the opening size depending upon the unit. Units would be prescribed burned to reduce fuels, cause additional mortality of undesirable trees, and preparing sites for natural regeneration.

Group 7: This group includes three treatment units comprising about 410 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. Where the opportunity exists, small trees would be cut to create small openings around available whitebark pine, ponderosa pine, western larch, and Douglas-fir trees to enhance the regeneration of those species. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration. The treatments would create patches of mortality up to 5, 10, or 20 acres depending upon the treatment unit.

Group 8: This group includes seven treatment units comprising about 4,604 acres. The treatments would cut small trees on portions of the treatment areas to create fuelbeds conducive to low-intensity prescribed burning. Where the opportunity exists, small trees would be cut to create small openings around available whitebark pine, ponderosa pine, western larch, and Douglas-fir trees to enhance the regeneration of those species. Units would be prescribe burned to reduce fuels, cause additional mortality of undesirable trees, and prepare sites for natural regeneration. The treatments would create patches of mortality up to 30 or 75 acres depending upon the treatment unit.

Aspen is in a number of units proposed for treatment. The aspen can be considered seral to either subalpine fir or Douglas-fir, depending upon the unit and site. In many unit exams, the aspen is simply recorded as being present, as rare, or as a trace; while in several other units it comprises a substantial, although still minor, portion of the stocking, for example Unit 3. Comments concerning the aspen in unit exams range from “suppressed in the understory” to “vigorous in the overstory, but proportionally not much suckering.” In general, we can characterize aspen in proposed units and the project area as (1) small clones, (2) heavily competing with—to suppressed by— conifers, and (3) a minor stand component (with a few exceptions).

Whitebark pine can be found in several units from groups 6, 7, and 8. In general, the whitebark pine in the project area is considered highly infected by white pine blister rust, and can be considered seral to subalpine fir. On sites where it is a seral species in the Northern Rocky Mountains, whitebark pine depends upon fire to maintain its dominance or presence (Arno 2001, Keane 2001, Kendall and Keane 2001, Morgan and Murray 2001). In the absence of fire, subalpine fir has increased in presence, and the combination of increased subalpine fir and whitebark pine mortality, and lack of regeneration due to white pine blister rust and mountain pine beetle have resulted in a decline in whitebark pine.

Alternative 3 Treatment Descriptions

Groups 1-8: Under alternative 3, treatments for units in groups 1-8 would be the same as discussed previously under alternative 2. The treated areas would change from that discussed in alternative 2 because under alternative 3 several units are not proposed for treatment and 12 units are proposed for treatment under new groups 9 and 10. Treatment acreages for alternatives 2 and 3 are displayed in table 45.

Group 9: Under alternative 3, about 1,040 acres would be treated with a low-intensity and low-severity prescribed burn (underburn). The purposes of the underburn would be to reduce surface and ladder fuels (small trees) and so modify future fire behavior while minimizing impacts to stand overstory and midstory stocking from the prescribed burn.

Group 10: This group includes units 46a and 47a. Treatments would be designed in a mosaic pattern to maintain cover and forage for wildlife while promoting ponderosa pine and aspen, and reducing ladder fuels. Portions of the stands would be thinned to (1) reduce understory competition from around large ponderosa pine trees, (2) thin heavily-stocked groups of trees on sites historically dominated by ponderosa pine, and (3) remove conifer competition from within and around quaking aspen. Treatment guidelines are as follows:

- To reduce understory competition around large ponderosa pine, and move areas toward or maintain multi-storied ponderosa pine structure, within 50 feet of ponderosa pine trees larger than 17 inches d.b.h. remove all but two trees. The retained trees should be of varied size and age classes.
- In areas dominated by ponderosa pine, but lacking live trees greater than 17 inches d.b.h., trees would be thinned to 48 to 109 trees per acre depending upon tree size.
- Ponderosa pine snags greater than 17 inches d.b.h. would be favored for retention to meet Forest Plan direction for snags.
- Conifers less than 17 inches d.b.h. would be removed up to 100 feet of existing aspen patches.
- Post-thinning, slash would be jackpot burned or hand-piled and burned to reduce fuels.
- Treatments would affect up to 50 percent of these units.

Table 44 displays the proposed treatment acreages for the action alternatives by prescription group.

Table 44. Prescription group acres by alternative

Prescription Group	Alternative 2 Acres	Alternative 3 Acres
1	974	232
2	1,132	822
3	892	664
4	223	152
5	25	25
6	303	326
7	410	36
8	4,604	3,265
9	0	1,040
Total	**8,564**	**6,564**

Direct and Indirect Effects Common to Alternatives 2 and 3

Proposed treatments would reduce surface, ladder and crown fuels and change the fuel model profile, thereby decreasing the area with potential for flame lengths greater than four feet and reducing potential crown fire risk. In addition, alternative 2 or 3 would reduce the risk of wildfire impacts to adjacent private lands and other resource values. Collins (2010) stated larger individual treatments have a greater potential to reduce fire behavior and slow fire spread, which ultimately impacts adjacent untreated stands and should enhance suppression opportunities and increase firefighter safety. By treating these areas, they become more resilient to stand-replacing wildfire and allow greater protection within the WUI zone. Minore (1979) noted that mixed-severity fires kill a large proportion of the most fire-susceptible tree species, such as subalpine fir, which tend also to be the shade-tolerant species favored by fire exclusion.

Barrett and Arno 1982 concluded implications for management of wilderness and other natural areas (such as roadless areas) are that lightning fires may not be frequent enough to re-create pre-settlement conditions. It may be necessary to set prescribed fires to achieve initial fuel reduction for returning some ecosystems to pre-settlement conditions. Such human-ignited prescribed fires in wilderness natural areas may also be justifiable in terms of resuming an ancient approach of using fire to accomplish multiple objectives.

Treatments would also help fire managers introduce more low-intensity prescribed fire in the future. National Forest System lands and adjacent private lands would be positively affected from the reduction of hazardous fuels and subsequent modification of potential fire behavior. In addition breaking up the continuous horizontal and vertical fuels could warrant changing portions of the Stonewall project area from a Fire Management Unit[18] 1 (FMU) “full suppression” to FMU-2 “modified suppression” and allow fires to be managed for resource benefit. (Kurtz 2009)

Scientific findings indicates the most appropriate fuel treatment strategy is often thinning (removing ladder fuels and decreasing crown density) followed by prescribed fire, piling and burning fuels, and mechanical treatments. These treatments would provide maximum protection from severe fires in the future (Peterson 2005). Other research shows that areas treated before a fire begins can decrease severity (Strom and Fulé 2007, Peterson et al. 2005, Omi and Martinson 2004, Agee and Skinner 2005, Graham 2004, Pollet and Omi 2002, Fulé et al. 2001).

Reinhardt et al. (2010) noted post-harvest slash treatment (mastication, whole tree yarding or no treatment) were not as important as harvest and prescribed fire treatments over time. “This may be because the slash treatments affected the surface fuels only and not the subsequent development of the stand. Thinning and prescribed fire, which change stand structure and composition, have much more lasting effects on fuels and fire potential.” However, in extreme weather conditions, such as drought and high winds, fuel treatments may have little effect on fire spread or severity (Pollet and Omi 2002).

Treatments on National Forest System land would reduce fire intensity and crown fire potential but may not directly protect all homes. Studies indicate that wildfire mitigation focused on structures and their immediate surroundings is the most effective way to reduce structure ignitions (Cohen 1999, 2000, 2003; Scott 2003). While individual home-by-home treatments can also help reduce the risk of loss to individual homes, relying solely on such treatments would forego strategic opportunities for controlling fires within this wildland urban interface area. Although homes in the path of a wildfire are perhaps the most immediately recognized value at risk, research shows that treatments need to go beyond the home ignition zone for other resource values (Graham 2004).

[18] Fire Management Unit is a unique land management area defined by land objectives, topographic features, values to be protected, political boundaries, fuel types, or major fire regimes. (2011 Helena FMP)

A study conducted by Graham and others (2009) of wildfires during the summer of 2007 that burned over 500,000 acres within central Idaho found that the limited loss of structures and resource damage was largely due to the existence of the fuel treatments and how they interacted with suppression activities. In addition to modifying wildfire intensity[19], the burn severity[20] to vegetation and soils within the areas where the fuels were treated was generally less compared to neighboring areas where the fuels were not treated. They noted that by modifying the fire behavior, the fuel treatments presented suppression opportunities that otherwise may not have been available. These opportunities ranged from providing locales to conduct burnouts[21], to the location of both hand and machine constructed fire lines. In particular, the mechanical fuel treatments were very effective in creating conditions where surface fires dominated. Because of the lower intensity of the surface fire in these areas, there were safe zones for firefighters and crews who could then readily suppress the numerous spot fires that often occurred. Their observations suggest fuel treatments that create irregular forest structures and compositions, both within and among stands, tend to produce wildfire resilient forests. Miller (2012) found that fires allowed to play their natural role created additional fuel breaks and reduced fuel loading.

Fire modeling suggests the proposed treatments would effectively reduce fire behavior. Following implementation of a chosen alternative, the treated areas should exhibit surface fire under the modeled conditions, making fire suppression efforts safer and more effective. With these alternatives, desired fuel loadings and fire behavior characteristics would be achieved and natural or prescribed fire could occur with less risk.

Little is known about treatment longevity but a few studies suggest that benefits to fire effects are limited to about 10-15 years (Finney et al. 2005). Collins et al. (2010) noted that in dense fire-excluded stands, multiple burns would be needed to achieve more long-lived effects.

Baker (2009) noted the need for land managers to reduce vulnerable fuels near housing, infrastructure, roads and other locations where human-set fires could spread into restoration areas. Implementing the alternatives would meet the collaborative restoration vision for the Southwestern Crown of the Continent (2010), which includes prescribed fire and natural ignitions as tools to restore species composition and structure in a predictable and beneficial manner. As climate change modifies forest ecology, fire management is appropriately adjusted. Forest restoration and fuel management activities facilitate the reduction of wildfire management costs while re-establishing natural fire regimes (Southwestern Crown Collaborative 2010).

Impacts of the treatments on standing dead trees would differ according to the various treatments. Regeneration harvest and intermediate harvest treatments are expected to reduce snag numbers, thereby reducing fuel-loading levels. Many of these treatments are located adjacent to private land, and it is expected treatments would reduce fuel loading to acceptable levels meeting fire and fuels management objectives. Post mechanical treatment burning may generate a small degree of mortality; however, it is not expected to negatively affect the fire and fuels resource. In units proposed for mixed-severity prescribed burning only, there would be substantial mortality in the neighborhood of 60 TPA, however it must be noted that almost 80 percent of the dead trees would be between 7 and 12 inches d.b.h. (Amell and Higgins 2014).

[19] Fire intensity is defined as the amount of energy of heat release per unit time.
[20] Fire severity is defined as the effect of a fire on ecosystem properties, usually defined by the degree of soil heating or mortality of vegetation.
[21] Burnout is defined as the act of setting fire inside a control line to consume fuel between the edge of the fire and the control line.

Cumulative Effects Common to Alternatives 2 and 3

Past wildland fire events have had an effect on the landscape and would continue in the future. Decades of fire suppression in many western forests have resulted in high tree densities from infilling with shade-tolerant, fire-sensitive tree species. Cumulative effects from wildfires and past management activities are discussed in the existing condition section. The existing condition has been influenced by fire exclusion and large fires, as well as natural and artificial activities including insects and disease and past timber harvest. It is impossible to predict when wildfire may occur in the future, or the subsequent effects of that fire.

Alternative 2 or 3 combined with other fuels reduction activities previously discussed under the no action alternative, would modify fire behavior by contributing to the overall reduction of surface, ladder, and crown fuels, thereby reducing fire intensity and crown fire potential within and adjacent to the project area. There is an indeterminate amount of fuels reduction activities (Fire Wise) work occurring on private lands adjacent to the project area. These combined treatments would complement the purpose and need goals for fire and fuels management by modifying fire behavior to enhance community protection opportunities, while creating conditions that allow for the re-establishment of fire as a natural process on the landscape.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 and 3 comply with Helena National Forest Land and Resource Management Plan goals, standards, and guides and National Fire Plan goals. The alternatives are responsive to the Tri-County Community Wildfire Protection Plan, and the Lincoln Restoration Committee and Montana Forest Restoration Committee's recommendations and objectives, and are in-line with the collaborative group's 13-Guiding Principles.

Alternative 2 – Proposed Action

With alternative 2, we are proposing to treat approximately 8,564 acres, which is equivalent to about 36 percent of the project area. The proposed treatments include under burning, jackpot and broadcast burning[22]. Site preparation burning is proposed, and would take place after harvesting is completed to prepare areas for tree planting. Prescribed burning is proposed as a stand-alone treatment in 15 units. Most of the prescribed burn only units are located in inventoried roadless areas. Where there is sparse vegetation in these units, small-diameter trees (less than 6 inches d.b.h.) would be cut and scattered. Cutting small trees ensures there are adequate surface fuels to carry the fire.

Helena National Forest personnel developed eight prescription groups to describe thinning and prescribed burning treatments for the proposed action. Prescription groups 1-5 would receive a silvicultural treatment prior to a prescribed burning treatment. Silvicultural treatments are discussed in detail in the DEIS (Amell and Klug 2015) and include precommercial thinning, intermediate harvest and regeneration harvest. Prescribed burning involves controlled application of fire to natural or activity created fuels. Natural

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[22] Under burn is defined as a fire that is constrained to surface fuel and therefore has a low to moderate fireline intensity (less than 300 kW/M) (2008 Firewords v1.0.2).

Jackpot burning is prescribed burning of concentrations of woody fuels.

Broadcast burning is a prescribed burning activity where fire is applied generally to most or all of an area within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both (NWCG 2011).

accumulated fuels and activity fuels generated as a result of harvest would be offered as fire wood to the public in areas where there is a large amount. In other areas, fuels would be piled and burned or underburned to reduce fuel loading levels.

In prescription groups 6-8, prescribed burning is proposed as a stand-alone treatment on 5,463 acres. The objective is to reduce surface, ladder and canopy fuels and break up contiguous vegetation. These treatments would reduce potential fire behavior and provide fire managers the opportunity to reintroduce fire to the landscape. Prescribed burning would be conducted using ground or aerial firing methods. Approximately 5,014 acres would be burned with varying fire intensities resulting in mixed-severity fire[23] effects. The majority of these units are typically high-elevation lodgepole pine stands with concentrations of subalpine fir and whitebark pine intermixed. The mixed-severity units are strategically placed to break up the continuous vegetation within the higher elevations, promote age class diversity, aspen regeneration and enhance whitebark pine habitat by creating openings suitable for regeneration (Kurtz 2009). Individual mixed-severity fires typically leave a patchy, erratic pattern of mortality on the landscape that fosters development of highly diverse communities (Arno et al. 2000). Overall, these fires kill a large proportion of the most fire-susceptible tree species, such as subalpine fir, and a smaller proportion of fire-resistant species including ponderosa pine, western white pine and whitebark pine, which are replaced successionally by shade tolerant species with fire exclusion (Arno et al. 1997). To meet objectives, approximately 20-60 percent of prescribed fire units would be blackened, creating a mosaic[24] of burned and unburned patches. Areas of prescribed burn units would result in mixed-severity fire effects with portions of the overstory canopy being blackened. Overstory canopy openings from approximately 5 acres to less than 75 acres are desired. The range of openings varies depending on the prescription group.

Of the 5,463 acres proposed for prescribed burning (without harvest), the remaining 449 acres would have low-intensity fire applied and are expected to result in low-severity fire effects. These units are primarily low-elevation, open Douglas-fir or mixed Douglas-fir/ponderosa pine stands with intermittent lodgepole pine. Low-intensity and prescribed fire would retain or promote open stands, reduce encroachment , retain large-diameter Douglas-fir and ponderosa pine, reduce the risk of crown fire, and reintroduce fire into a fire-adapted ecosystem. To meet objectives, estimated overstory canopy openings would equate to less than 20 percent in these units. These openings would range from 5 acres to approximately 10 acres.

Slashing[25] treatments using chainsaws are proposed in prescription groups 6-8 (prescribed-burning units) prior to burning. Slashing small trees increases surface fuel loading to ensure there is sufficient fuel to carry the fire. This enables fire managers more flexibility in accomplishing prescribed fire objectives at lower temperatures, higher relative humidity and creates varying fire intensity levels. Fire intensity variations would create a mosaic burn more representative of a natural fire (see appendix B, table B-1 for treatment descriptions by unit).

All prescribed burning would occur when weather and fuel conditions are favorable. All burning would take place under the guidelines in the prescribed fire burn plan developed specifically for project-related burning activities. Prescribed burn plans address parameters for weather, air quality, contingency resources and potential escapes. Table 45 displays the prescription groups and the approximate number of acres that would receive prescribed burning treatments.

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[23] Mixed Severity Fire is a broad fire severity classification that refers to fire effects intermediate between the low severity and replacement severity (FRCC Guidebook 2010).
[24] Mosaic Fire is any landscape-scale mixed fire that has scattered patches across the fire perimeter, resulting in a mosaic of burned and unburned patches (Hann 2004).
[25] Slashing involves cutting small-diameter trees less than 6 inches diameter breast height (d.b.h.).

Table 45. Proposed burning treatments and approximate acres of prescription group for alternative 2

Group	Group Treatment Title	Acres*
1	Prescribed under burning and jackpot burning following harvest	974
2	Pile burning following harvest	1,132
	Under burning or slash treatment adjacent to private	
	Under burning following harvest	
3	Prescribe under burning, jackpot and broadcast burning following harvest	745
	Site prep burning following harvest	
	Pile burning following harvest	
4	Prescribe under burning, jackpot and broadcast burning following harvest	223
	Site prep burning following harvest	
5	Piling and burning of excess fuels following harvest	25
6	Low Severity Prescribed Fire, canopy openings of approximately 5 to 10 acres	449
7	Mixed Severity Fire, canopy openings of approximately 5 to 20 acres	410
8	Mixed severity fire, canopy openings of approximately 30 – 75 acres	4,604
	Total	**8,564***

*The total represents the total acres of prescription groups, not all acres would be treated.

Fire modeling was used to evaluate the potential flame length associated with fireline intensity and crown fire under alternative 2. The results for potential flame length for alternative 2 are shown in table 46 and visually displayed in figure 45. Fire type potential is also summarized in table 46 and displayed in figure 46.

Table 46 Fire behavior potential under alternative 2

Potential Fire Behavior Characteristic		PERCENT [A]
Flame Length	<= 4 feet	89
	> 4 feet	11
Fire Type	Surface	87
	Crown	13

[a] -Percent of burnable acres- Non-burnable acres are not shown in table

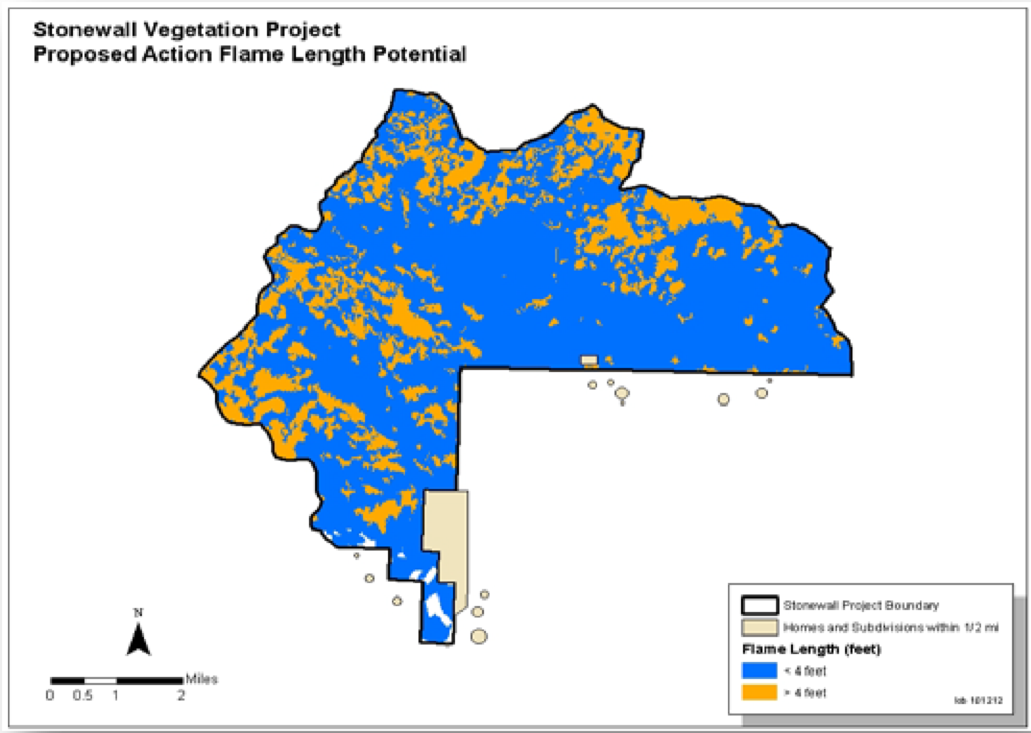


Figure 45. Alternative 2 – proposed action fire behavior potential displayed as flame length

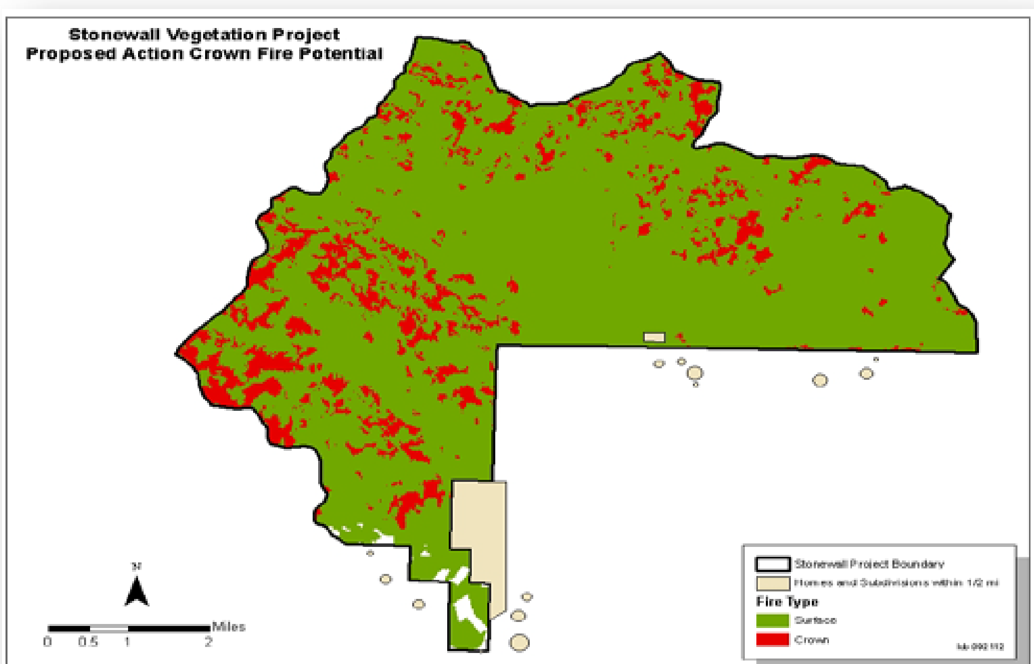


Figure 46. Alternative 2 – proposed action fire behavior potential displayed by fire type

Maximum Management Area (MMA)

Maximum Management Areas (MMAs) have been identified for the Stonewall Project area. A maximum management area is a pre-identified boundary that allows a prescribed fire to exceed the unit boundary. An MMA generally follows natural barriers, old fire scars and access points. MMA treatment areas would enable fire managers more flexibility in implementing prescribed burning operations. Establishing MMAs was determined to be an important component of implementing this project because there are contiguous fuels with few natural barriers, limited access into remote units, more complexity in prescribed fire prescriptions due to location of burn units and the existing and projected condition of vegetation and fuels. As long as the prescribed fire stays within the MMA boundary, it does not have to be declared a wildfire and can be managed as a prescribed fire as long as the following conditions are met. The anticipated effects of a prescribed fire that leaves unit boundaries and encroaches into the pre-defined MMA area would be similar to the effects expected within prescribed burn units. Vegetation in MMA areas would exhibit similar post-burn conditions as prescribed burn units, and it is estimated no more than 50 percent of each MMA would be burned. Project Design Features (pdfs) are established to minimize impacts to resources throughout the project area, and would also apply to MMA areas. All burning in MMA areas would take place under guidelines set forth in a prescribed fire burn plan developed specifically for this project area. Prescribed burn plans address parameters for weather, air quality, and contingency resources.

- Any fire that moves outside the prescribed burn unit boundary has to meet burn plan prescriptions and objectives for resource benefit.
- Total burned area within the MMA would not exceed 50 percent
- If the 50 percent margin is reached, acres from the units not yet burned would be dropped to not exceed 50 percent
- A prescribed fire that exceeds the MMA would be declared a wildfire.
- Ignition operations would not occur outside prescribed unit boundaries.

Alternative 3

Some units in alternative 3 were dropped from treatment, unit boundaries were modified and treatment methods changed as compared to alternative 2. Under alternative 3 we are proposing to treat 6,564 acres, approximately 27 percent of the project area (table 47). Prescription groups 9 and 10 were developed for this alternative, and include low-intensity under burning. Group 9 includes approximately 1,040 acres in 10 units. Treatment units or portions of units were removed from prescription groups 1, 3 and 4 and added to group 9. Low-severity under burning in these units would reduce surface and ladder fuels while minimizing impacts to overstory residual trees. Prescription group 10 includes units 46a and 47a, which were originally included in Group 1 under alternative 2. Treatments in group 10 would be designed to maintain cover and forage for wildlife while still meeting fuels management objectives by reducing fuels.

Table 47. Proposed burning treatment and total acres of prescription groups under alternative 3

Group	Group Treatment Title	Acres
1	Prescribed under burning following harvest	232
2	Pile burning following harvest	822
	Under burning or slash treatment adjacent to private	
	Under burning following harvest	
	Pile burning and under burning	
3	Prescribe under burning, jackpot and broadcast burning following harvest	664
	Site prep burning following harvest	
	Pile burning following harvest	
4	Prescribe under burning and broadcast burning following harvest	152
	Site prep burning following harvest	
5	Piling and burning of fuels following harvest	25
6	Low intensity and low severity Prescribed Fire, with canopy openings of less than 5 acres	326
7	Mixed severity fire, with canopy openings of 5-20 acres	36
8	Mixed severity fire, with canopy openings of 30-75 acres	3,265
	Mixed severity fire, openings <75 acres	
9	Low intensity, Low severity Jackpot and under burning	637
10	Jackpot and/or hand pile burning activity fuels as needed	403
	Total	**6,564***

*The total represents the total acres of prescription groups, not all acres would be treated.

Fire modeling was used to evaluate the potential flame length associated with fireline intensity and crown fire under alternative 3. The modeled outcomes are summarized in table 48 and visually displayed in figure 47. Fire type is also summarized in table 48 and displayed in figure 48. Under alternative 3, the fuel profile is modified over less area than under alternative 2, resulting in less overall change in fire behavior.

Table 48. Fire behavior potential under alternative 3

Potential Fire Behavior Characteristic		Percent
Flame Length	<= 4 feet	76
	> 4 feet	24
Fire Type	Surface	85
	Crown	15

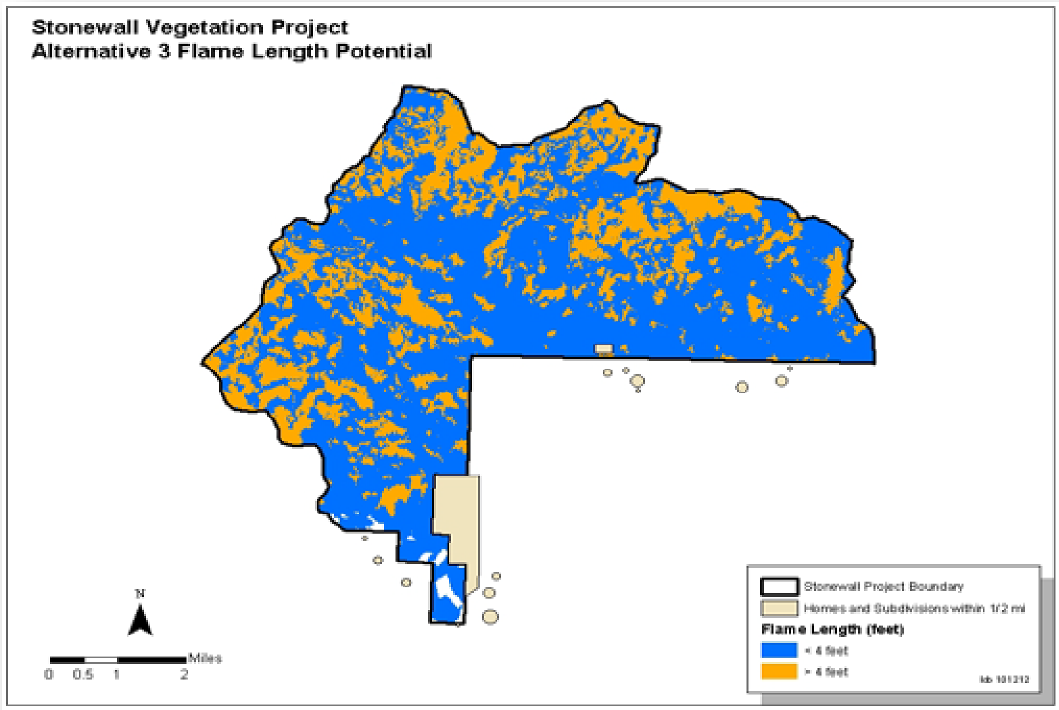


Figure 47. Alternative 3 fire behavior potential displayed as flame length

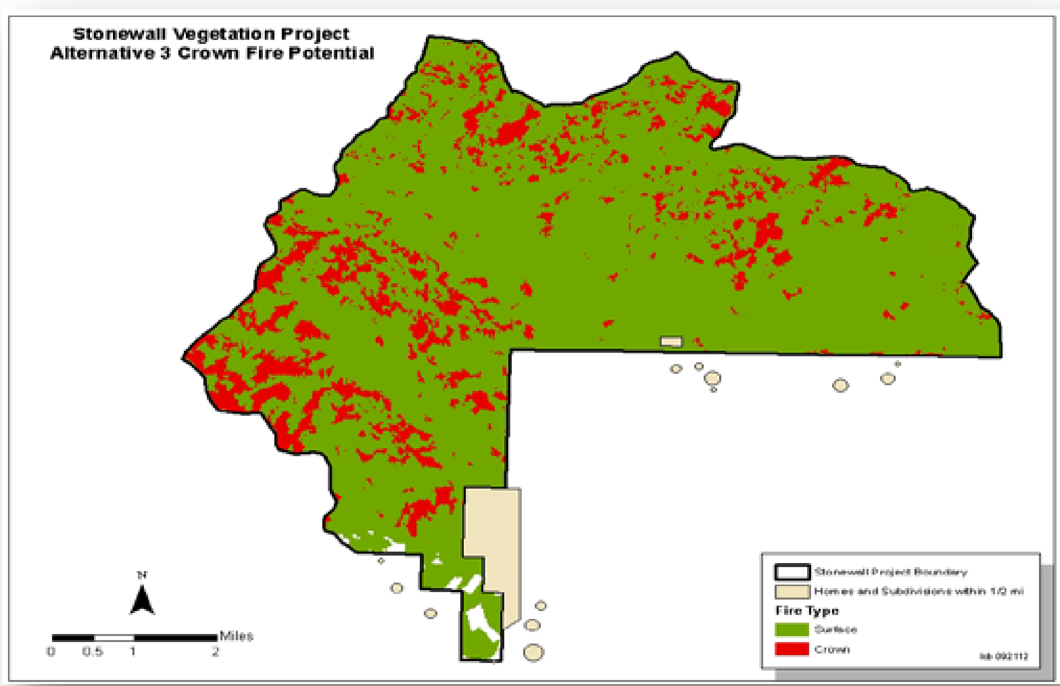


Figure 48. Alternative 3 fire behavior potential displayed by fire type

How the Alternatives Meet the Identified Issues

The following issues or concerns were identified for this project during the scoping period. The alternatives would address the issues as follows.

1. Identified Issue/Concern: Wildland Fire and Homes: Proposed treatments may be inefficient and ineffective in reducing home losses due to fire.

Proposed treatments would reduce surface, ladder and crown fuels and change the fuel model profile, thereby decreasing the area with potential for flame lengths greater than four feet and reducing potential crown fire risk. In addition, alternative 2 or 3 would reduce the risk of wildfire impacts to adjacent private lands and other resource values. By treating these areas, they become more resilient to stand-replacing wildfire and allow greater protection within the WUI zone.

2. Identified Issue/Concern: Fire Behavior: Proposed fuels reduction work will not reduce fire behavior.

Fire modeling suggests the proposed treatments would effectively reduce fire behavior. Following implementation of a chosen alternative, the treated areas should exhibit surface fire under the modeled conditions, making fire suppression efforts safer and more effective. With these alternatives, desired fuel loadings and fire behavior characteristics would be achieved and natural or prescribed fire could occur with less risk.

3. Identified Issue/Conern: Prescribed Burning: Concerns over risk of fire escaping burn boundaries during prescribed burning operations.

All prescribed burning would occur when weather and fuel conditions are favorable. All burning would take place under the guidelines in the prescribed fire burn plan developed specifically for project-related burning activities. Prescribed burn plans address parameters for weather, air quality, contingency resources and potential escapes.

Summary

The mechanical treatments proposed would reduce surface fuels, raise canopy base heights by reducing ladder fuels and stand density, resulting in modified fire behavior potential. The result would be safer, more efficient and direct initial attack of unwanted fires by fire suppression forces.

The prescribed burn treatments would reduce fuels and break up contiguous vegetation to create a heterogeneous fuelscape so that areas with high fire behavior potential are interspersed with areas of mixed and low fire behavior potential, thereby limiting the potential for high-intensity crown fire to spread towards the WUI. Fire management has evolved over time and fire managers look for opportunities to manage fire for multiple objectives. Reintroducing fire to the landscape and allowing it to occur as a natural process is desired in order to move the landscape toward the desired condition as outlined in the LRMP.

The Stonewall Vegetation Project would be important to the success of future fire suppression efforts and complements past treatments and those currently occurring or being proposed on adjacent federal, state and private lands.

Air Quality

Introduction

The smoke from combustion contains a number of pollutants, including microscopic particles referred to as "particulate matter" (PM). Exposure to PM can cause significant health problems, especially for people suffering from respiratory illnesses. Smoke also adversely affects the clarity of the air, or visibility. The Environmental Protection Agency (EPA) has revised the air quality standards to provide improved health and visibility protection. With these standards in place land managers must consider using techniques that minimize prescribed fire emissions and the adverse impacts of smoke on public health and the environment. Careful planning and cooperation among land managers, air quality regulators, and local communities ensures that prescribed fire, clean air and public health goals can be met.

This analysis describes the existing condition of the air quality resource within the project area and evaluates the potential effects of the proposed action and the no-action alternative. We used the best available science in this analysis; however, we understand that opposing science exists. A literature review listing the opposing science sent to the project in public comment scoping responses, and the accompanying Forest Service response, is in the project record at the Lincoln Ranger District.

Methodology

Analysis of smoke production used current versions of FOFEM 5 (First Order Fire Effects Model), CONSUME 2.1, and SIS (Smoke Impact Spreadsheet) smoke production models (Schaaf and Norville 2002). Embedded in SIS is a module that calculates emissions using FOFEM 5 and the CONSUME 2.1 Pile Wizard. A dispersion module is also incorporated into the spreadsheet that calculates down-wind concentrations using the CALPUFF dispersion model. The use of each model is recommended through guidance specific to USDA Forest Service Region 1 Forests, and encouraged by State open burning regulations defining Best Available Control Techniques for prescribed wildland open burning in ARM 17.8.601(1)(a)(iii).

Threshold for Significance

The threshold for significance is the Federal and State regulatory standard of 35 $\mu g/m^3$ for PM2.5 and how the modeled PM2.5 emissions compare with the regulatory standard.

Assumptions and Variables Used In the Models:

All model runs were conducted using the following vegetation types: SAF 210 Interior Douglas-fir and SAF 218 Lodgepole Pine. For alternative 1 analysis, it was assumed a natural wildfire burning during the summer would burn 230 acres per day, the wildfire was burning through fuel model G with a natural fuel load, and the meteorological values and mixing heights used resulted in an excellent ventilation index. An additional model run for alternatives 2 and 3 was conducted using slash fuel loading conditions for a prescribed burn in the fall. It was assumed the entire burn unit selected for modeling would be ignited all at once to show the maximum result of emissions that could be produced under the circumstances.

For alternatives 2 and 3 pile burning, it was estimated there would be 15 piles burned per day with forty-minute ignition intervals. The piles were modeled as 25 feet wide by 10 feet high with a 10 percent packing ratio.

Limitations

Because model inputs are constant and there is no avenue to incorporate variability due to landscape, weather changes or human factors, the models do not precisely determine the exact amount of smoke or pollutant released. The possibility of increased smoke production and duration of smoke release exists due to the potential for multiple day burn windows, unpredicted stable air masses settling over the burn area and unexpected changes in weather conditions. Given the uncertainty of any modeling exercise, the results are best used to compare the relative effects, rather than as an indicator of absolute effects (Graham et al. 2004).

Spatial and Temporal Context for Effects Analysis

Spatial Bounds

A maximum perimeter distance of 50 miles was considered for effects. This allows for consideration of the effects to Class 1 areas.

Temporal Bounds

The time span of 1-5 days was chosen because smoke from prescribed burning is usually transitory in nature and impacts to air quality are expected to be relatively short lived, lasting 1-5 days after ignition is completed.

Measurement Indicators

The measurement indicator is the predicted smoke emissions ($PM_{2.5}$) on sensitive receptors up to 50 miles downwind of the project area.

Overview of Issues

There is concern about the possible effects on human health from smoke as a result of prescribed burning operations. There is also concern the proposed project would negatively affect air quality and visibility in the surrounding communities and nearby wilderness areas.

Indicators

The measurement indicator is the predicted smoke emissions ($PM_{2.5}$) on sensitive receptors up to 50 miles downwind of the project area and how that compares with appropriate Federal and State regulatory standards and requirements.

Affected Environment

Existing Condition

Analysis Area

The project area lies within Montana/Idaho Airsheds 3B and 6. A portion of the project area lies in Powell County with the remainder in Lewis and Clark County. Airsheds are defined and managed by Montana Department of Environmental Quality (MDEQ).

Air Quality

Air quality within the project area is generally good. Limited local emission sources exist including residential wood burning, debris burning, road dust, light industry, vehicles, construction equipment and wildland fire. The greatest emissions occur during the winter from residential wood burning stoves used for indoor heat. Wildland fires can produce substantial emissions in the summer and fall for short to moderate durations.

Generally, dispersion of emissions within the project area is good due to the terrain and wind activity. There is consistent wind dispersion during much of the year. Up valley winds during the day and down valley winds (cold air drainage) at night can dominate more than overall prevailing wind direction on ridge tops. Inversions sometimes develop in the valley during winter burning periods with stable atmospheres.

Visibility at Class 1 Areas

The Clean Air Act (1963) establishes as a national goal "the prevention of any future, and the remedying of any existing impairment of visibility in mandatory class 1 Federal areas which impairment results from manmade air pollution" (42 U.S.C. §7491 et seq.).

The Clean Air Act Amendment of 1977 designated wilderness areas existing at that time to be class 1 areas. Areas designated Wilderness after 1977 are classified as class 2, unless they are additions to existing class 1 areas. The class 1 areas nearest to the Stonewall Vegetation Project area are the Scapegoat Wilderness, 1 air mile north, the Bob Marshall Wilderness approximately 18 air miles northwest, Mission Mountain Wilderness 48 air miles northwest, Gates of the Mountains 36 air miles southeast and the Flathead Reservation 40 air miles west. These areas could be affected by the proposed project during periods of atmospheric stability.

The Clean Air Act also allows the states to designate future wilderness areas as class 1 using normal state processes. These national park and wilderness areas are afforded visibility protection from anthropogenic sources of air pollution, including emissions from prescribed burning. Montana has twelve mandatory class 1 federal areas as outlined in 40 CFR 81.417.

Visibility impairment is a basic indicator of air pollution. The EPA has determined that regional variation in visibility needs to be addressed. The Regional Haze Regulations for Protection of Visibility in National Parks and Wilderness Areas (1997) are intended to improve visibility or visual air quality in 156 national parks and wilderness areas across the country. These regulations apply to all states, including those that do not have class 1 areas, because pollution that occurs in those states may contribute to impairment in other states or class 1 areas and must be accountable. The regional haze regulations propose "presumptive reasonable progress targets" for improving visibility in each class 1 area. The progress targets are described in terms of deciviews, a measure for describing perceived changes in visibility. For example, a deciview of zero represents pristine conditions.

A requirement of Prevention of Significant Deterioration (PSD) in class 1 areas is that new stationary sources must have a PSD permit. A stationary source is a source of pollution well defined, such as a smokestack. The Stonewall Vegetation Project is not considered a major stationary source and is not subject to the PSD permitting requirement.

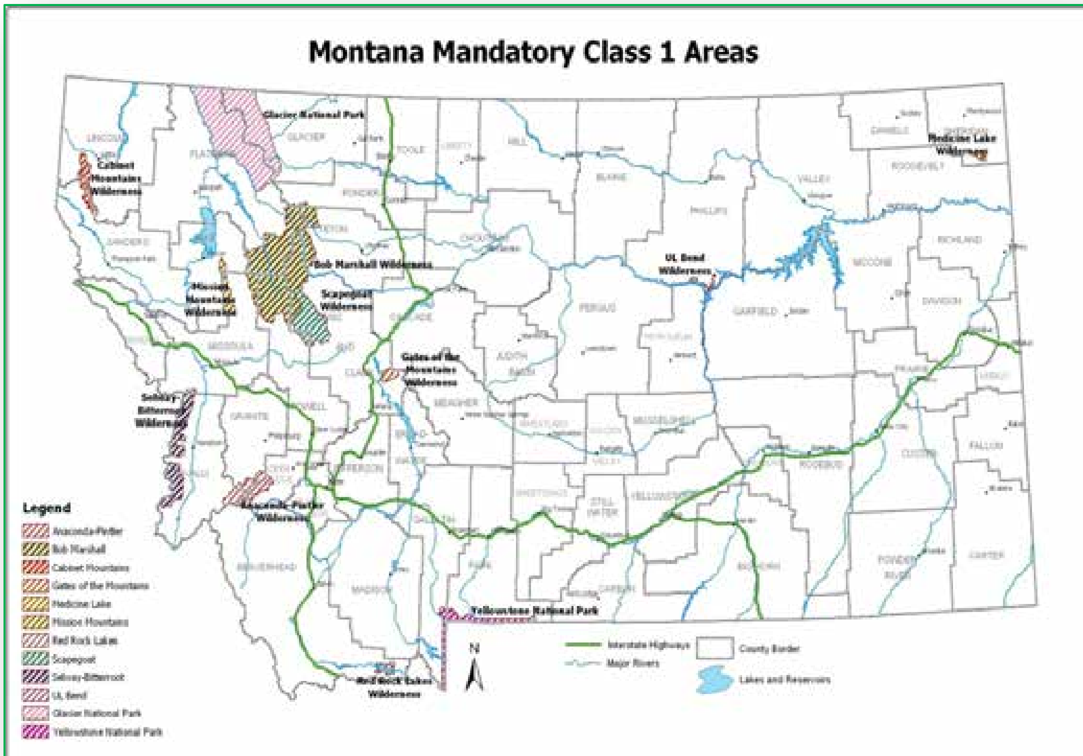


Figure 49. Montana Class 1 Area Map

Pollutants

Airsheds can include both attainment and nonattainment areas; designations EPA uses to describe the air quality in a given area for any of six common pollutants referred to as “criteria pollutants.” The pollutants are: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2) and particulate matter (PM). Carbon monoxide in high concentrations can be extremely hazardous to humans and animals, but its health impacts are usually only significant for personnel directly exposed to smoke (e.g. firefighters) (Hardy et al. 2001).

In addition to effects on health, some pollutants may also contribute to the formation of ozone in the atmosphere (Malm 1999). Lead at low levels can cause health problems either by inhalation or ingestion. Nitrogen dioxide may cause increased respiratory illnesses and harm lung function in people with existing respiratory illnesses. Breathing ozone can also trigger health problems and worsen bronchitis and asthma. Sulfur dioxide may also have adverse respiratory effects on humans with existing respiratory illnesses.

The main pollutants monitored for prescribed fire emissions are particulate matter. Particulate matter is fine material, of any substance, in sizes small enough to remain suspended in air for long periods.

Two standards apply to particulate matter and they are distinguished by the size of particulate matter described. PM_{10} describes all fine particles no larger than 10 microns in size. These particles can be harmful to human health because their small size allows them to bypass the filtration of the upper respiratory system and become lodged deep within the lungs. Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse." Sources of coarse particles include crushing or grinding operations and dust from paved or unpaved roads. Other particles may be formed in the air from the chemical change of gasses; they are indirectly formed when gases from burning fuels react with sunlight and water vapor. These can result from fuel combustion in motor vehicles, at power plants and in other industrial processes. PM_{10} has been the pollutant particulate level standard against which EPA has been measuring Clean Air Act compliance.

The description $PM_{2.5}$ refers to particles that are no larger than 2.5 microns (approximately 1/30th the average width of a human hair). These are harmful in the same way as larger PM_{10} particles, but can lodge even deeper in the lungs due to their smaller size, and are associated with serious health problems and premature mortality. Particulate matter also has an adverse effect on maximum sight distance and scenic visibility. Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning) and certain industrial processes. The particulate level $PM_{2.5}$ would have the most significant impact in the project area as well as the area and people surrounding the project area, and is the focus of this analysis.

Nonattainment Areas

If a community does not attain the National Ambient Air Quality Standard (NAAQS) for one or more pollutants, the EPA would designate it a nonattainment area. States must demonstrate to the public and the EPA how a nonattainment area would meet the NAAQS, based upon the control of emission sources. Such demonstrations employ control plans that are part of each State Implementation Plan (SIP), including emissions from prescribed fire.

Lewis and Clark County is in nonattainment for Sulphur Dioxide (SO_2) and Lead (Pb) as determined by the EPA: Criteria Pollutant Area Summary Report (Green Book) (EPA 2011b).

Smoke-sensitive Areas

Smoke-sensitive areas are defined as:

> "The distance and direction of sensitive areas should be disclosed. These are areas that could be impacted by the proposed burning activity and are considered sensitive due to legislation, air quality concerns, or public concerns. Examples of sensitive areas are Class I areas, non-attainment areas, impact zones identified by the Montana / Idaho State Airshed Group, or major transportation corridors near or downwind from the proposed burning activity and population centers. To be consistent with other air quality permitting, it is suggested that areas within a 100 km radius, especially those areas downwind, should be identified" (Acheson et al. 2005).

Table 49 displays a list of some of the sensitive receptors that could be impacted by smoke out to 50 miles from the project area (list is not all-inclusive). A mapped overview of the potential smoke impact area is in figure 2 in appendix A of this document.

Fugitive Dust from Vehicle Traffic on Unpaved Roads

Fugitive road dust is a result of motorized vehicle use on dry unpaved roads and is caused by the force of the wheels moving across the road surface causing pulverization of surface material. Dust is then lofted by the rolling wheels and the turbulence caused by the vehicle itself. This air turbulence can persist for a period of time after the vehicle passes. The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Variables that influence the amount of dust produced include the average vehicle speed, vehicle weight, number of wheels per vehicle, the road surface texture, and the fraction of road surface material classified as silt as well as the moisture content of the road surface. The moisture content of the road surface has the greatest influence on the amount of fugitive dust produced.

Several activities may contribute to fugitive dust effects within the project area including equipment and vehicle travel on forest roads during mechanical and prescribed burning operations, as well as felling, skidding and piling of material at landing sites. These activities are not anticipated to result in significant impacts to regional air quality because of the transitory nature of fugitive dust, and therefore were not modeled for this analysis.

Table 49. Summary of sensitive receptors adjacent to or near the project area

Sensitive Receptors	Direction To Location Of Potential Receptor	Approximate Distance (Miles) From Project Area To Potential Receptor
Seeley Lake Community	NW	38
Ovando	W	15
Helmville	SW	12
Deerlodge	S	42
Helena	SE	37
Wolf Creek	SE	25
Augusta	N	37
Drummond	SW	26
Phillipsburg	SW	49
Lincoln Community	SE	4
Missoula Impact Zone	W	44
Flathead Reservation (class-1)	W	44
Bob Marshall Wilderness (class 1)	N	20
Scapegoat Wilderness (class 1)	N	1
Gates of the Mountains (class 1)	E	40
State Highway 279	E	10
State Highway 200	S	adjacent
US Highway 287	E	24
Interstate Highway 90	S	25
State Highway 83	W	27

Environmental Consequences

Effects Common to All Action Alternatives

There is concern about the possible effects on human health caused by smoke generated from prescribed burning operations under the action alternatives. There is also concern the proposed project would negatively affect air quality and visibility in the surrounding communities and nearby wilderness areas.

Alternative 1 – No Action

Direct Effects

This alternative has no direct effect on air quality because no treatment activities are proposed.

Indirect Effects

Under this alternative, no treatments would occur and there would be no anthropogenic emission contribution to degrade air quality. However, this alternative could lead to increased accumulation of ground fuel due to insect and disease activity and continuous natural forest succession. This accumulation of ladder and ground fuels may lead to an increased probability of high intensity wildfire in the future which could result in air quality degradation. Air quality can be degraded by smoke from wildfires to the point of human illness in some instances. Hardy (2001) noted emissions from wildfire are typically greater than emissions from a prescribed fire on the same acreage due to greater emission factor, fuel consumption, and fire intensity. Wildfires are also known to result in high levels of emissions, and associated NAAQS violations. Smoke from wildfire can cause visual impacts to the surrounding area and create hazardous driving conditions on adjacent state, county, and Forest Service roads for extended periods of time. Should a wildfire occur, dust emissions from fire suppression equipment could also show a marked increase. In the short-term air quality impacts from alternative 1 would be less because prescribed burning and pile burning would not occur. In the long term, the no-action alternative would not meet the purpose and need of this project, which includes modifying fire behavior to enhance community protection. For example, under the no-action alternative the emissions from a hypothetical wildfire was modeled and the results are displayed in table 50 that follows.

The modeling results include projected emissions from a 230-acre wildfire scenario burning during the summer. The estimated $PM_{2.5}$ concentration is 153.47 µg/m³ 0.1 mile downwind of the hypothetical wildland fire exceeding the $PM_{2.5}$ threshold of 35µg/m³.

Table 50. $PM_{2.5}$ concentrations from wildfire burning under no action alternative

Downwind Distance from Wildland Fire Scenario (miles)	24-Hour Average $PM_{2.5}$ Concentrations (µg/m³)
0.1	153.47
1.0	17.61
5.0	6.01
10.0	4.11
20.0	2.51
30.0	1.80
40.0	1.40
50.0	1.14

Cumulative Effects

There are no activities proposed for the no-action alternative, therefore it does not have a direct effect on air quality. This alternative does have the potential for a major indirect effect if a wildfire were to occur in the untreated project area.

Previous wildfire activity and increasing conifer mortality due to insect and disease can influence the amount of material available for consumption in the event of a future wildfire.

Emissions sources contributing to particulate matter and other pollutants would continue to be present. These sources include wood burning stoves, vehicle exhaust, emissions from recreational campfires, emissions associated with prescribed fire, fugitive dust and wildfires within or near the project area. Wildfire frequency is expected to continue as it has been observed in the past. An unwanted wildfire could lead to negative cumulative effects and would be dependent upon the size and intensity of the wildfire. Visibility impairment and human health impacts due to sudden and dramatic pollutant release are likely with a large wildfire event. Cumulative effects of smoke are unknown because the intensity and size of a wildfire is unknown. Research indicates wildfires can produce nearly twice the amount of smoke as prescribed fire (Huff et al. 1995).

Alternative 2 and 3

Alternatives 2 and 3 propose the same type of fuel treatments including; jackpot burning, pile burning, underburning, site preparation burning and mixed- and low- severity prescribed fire. Air quality modeling focused on prescribed fire and landing pile burning. Although alternative 2 would include more acres of all prescribed burning, only a certain number of acres could be burned per day under either alternative. Therefore, the daily effects of both alternatives are described here together. Table 51 shows the total acres for each alternative.

Table 51. Acre comparison by treatment for each alternative

Treatment	Alternative 2	Alternative 3
Underburning	1,824	1,648
All other burning including Jackpot, Site Prep	752	878
Prescribed Fire	5,463	3,627
Total	**8,039**	**6,153**

Table 52 and table 53 show the modeling results for a prescribed burn scenario conducted in the fall and for a pile-burning scenario conducted in the winter.

The projected $PM_{2.5}$concentration at .01 mile downwind is well below the Federal NAAQS and State MAAQS 24-hour average concentration threshold of 35µg/m³ for both scenarios. Since the nearest class 1 area is approximately 1 mile away, the results further show there would be no significant impacts to any class 1 area (figure 50). The smoke concentrations from prescribed burning operations under these alternatives are expected to be within NAAQS and state of Montana air quality standards. Montana's smoke management program is EPA-certified, and the prescribed fire activities associated with the Stonewall Vegetation Project would meet Clean Air Act General Conformity Rule requirements.

Table 52. Alternatives 2 and 3 prescribed burning concentrations

Results For A Fall Prescribed Burn Scenario	
Downwind Distance from Burn Unit (miles)	**24-hour Average $PM_{2.5}$ Concentrations (µg/m³)**
0.1	26.15
1.0	8.71
5.0	3.79
10.0	2.38
20.0	1.34
30.0	.92
40.0	.72
50.0	.62

Table 53. Alternative 2 and 3 pile burn concentrations

Results For A Landing Pile Burn Scenario	
Downwind Distance From Pile (Miles)	**24-Hour Average $Pm_{2.5}$ Concentrations (μg/M³)**
0.1	31.27
1.0	13.25
5.0	4.28
10.0	.96
20.0	.30
30.0	.13
40.0	.11
50.0	.094

Stonewall Project Potential Smoke Impact Map
June 22, 2011

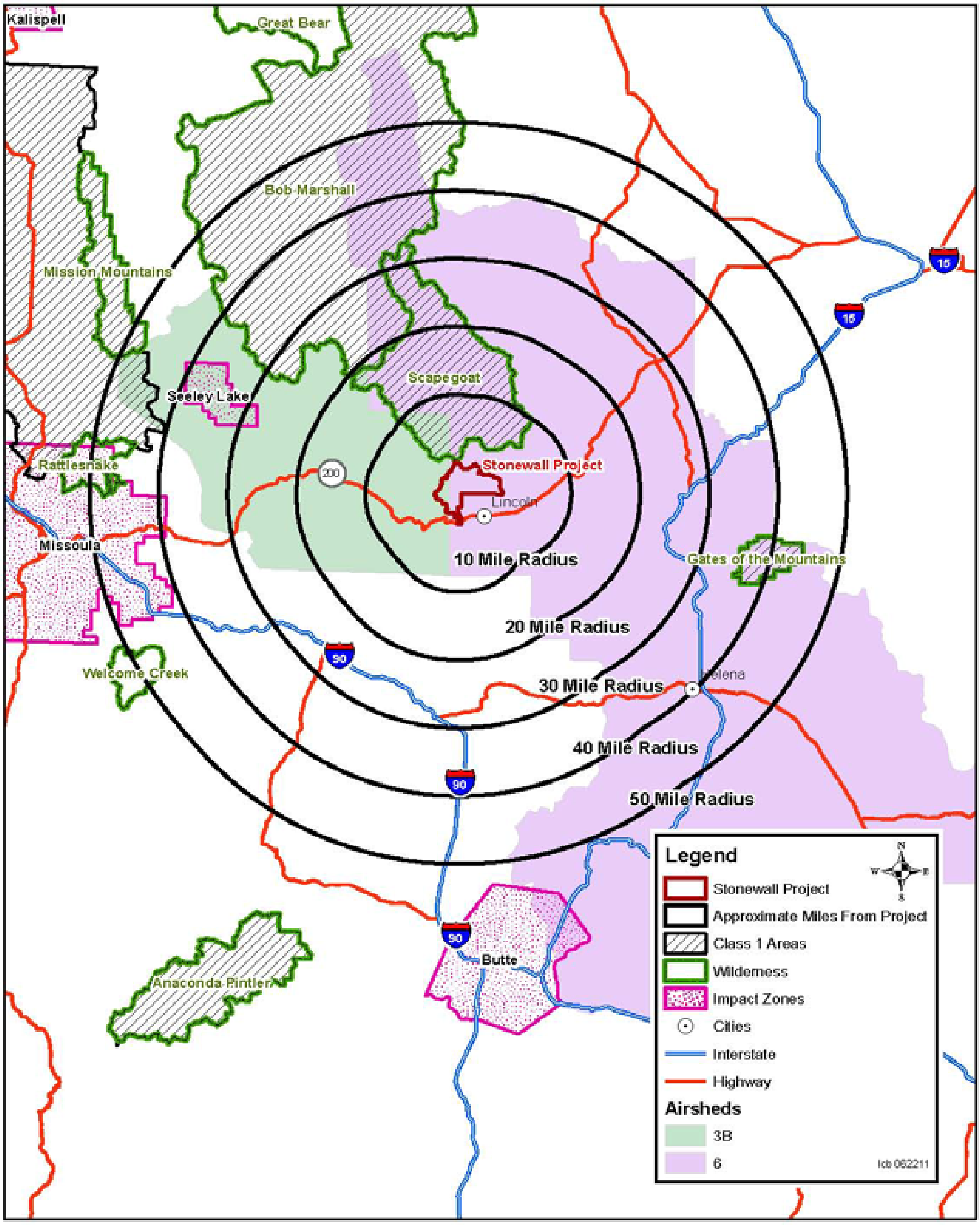


Figure 50. Stonewall Project potential smoke impact map

Project Design Features

All prescribed burning would be implemented in full compliance with the Montana Department of Environmental Quality (MDEQ) air program with coordination through the Montana/Idaho Airshed Group and reported to the Airshed Coordinator on a daily basis.

Burning would be dependent upon site conditions and weather conditions. Notice of the pile and prescribed burning timeframes, or burn windows, would be shared with the public through paper notices and announcements on the Forest website.

Direct Effects

Prescribed burning treatments would have direct, short-term impacts on air quality in the project area and possibly to regional air quality.

Prescribed fire treatments for this project would occur during the spring and/or fall seasons and when weather conditions and dispersion forecasts are favorable. Burning of landing piles and hand piles generally occur during late fall, early winter or spring, and typically after an area has received significant rain or snow to prevent the pile from spreading and reduce the risk of escape. All burning operations are conducted under the guidelines set forth in a prescribed fire burn plan developed by fire managers specifically for the project area. Prescribed burn plans address parameters for weather, air quality and contingency resources. All burning would occur over the life cycle of the project estimated at 5 to 10 years. Transitory smoke as a result of implementation of alternative 2 or 3 could produce some smoky days in the local area, and may also result in the form of nuisance smoke, smell, or haze. Smoke would also be expected to settle into the lower draws and drainages during the evening hours following ignition. This would most likely occur during the burn smoldering phase.

Indirect Effects

One objective of the project is to modify fire behavior to enhance community protection in the event of a future wildfire. Wildfires present a risk to public health and result in damage to both the environment and property. Wildfires are known to result in high levels of emissions and associated NAAQS violation and worst visibility. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems. According to (Wiedinmyer and Hurteau 2010) wide-scale prescribed fire application can reduce CO_2 fire emissions for the western US by 18 to 25 percent. The total amount of pollutants released by prescribed burning under alternative 2 and 3 would be spread out over several years and would occur when emissions would be unlikely to have significant adverse effects on human health and visibility. After implementation, it is estimated that subsequent wildfires in the project area could produce less pollutants due to less fuel available to burn.

Cumulative Effects

Cumulative effects on air quality as a result of the implementation of alternative 2 or 3 would result in an incremental decrease in air quality as pollutants from this project combine with other particles produced by the implementation of other aspects of this project, specifically fugitive road dust. Emitted pollutants from fire do have an effect on an area, which depends on atmospheric conditions at the time of the fire. Pollutants from fires can be cumulative with emissions from many local and regional sources, including other fires, vehicles, industrial sources, buildings and agriculture. Because of the widespread and short-lived impacts of emissions from fire, no other projects were explicitly considered for cumulative impact analysis. It is impossible to predict what pollution sources may be present at the time of a fire occurring at an unspecified date in the future.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All prescribed burning would be implemented in full compliance with MDEQ air program with coordination through the Montana/Idaho Airshed Group. All action alternatives would meet Forest Plan Standards for air quality by following coordination requirements. The project complies with the Federal Clean Air Act.

Habitats of Special Concern

Introduction

This section discusses snag and old growth availability as well as proposed treatment effects in the Stonewall Vegetation Project analysis area.

Methodology

The discussion below identifies information sources, analysis assumptions and analysis methods used. Information sources are not described in detail. For details concerning individual information sources see the Vegetation Section and the Stonewall Silviculture Report (Amell and Klug 2015). All information for this section was provided by the Helena National Forest or was acquired from the Region 1 and 4 Forest Health Protection Program.

Information Used

Information used in this analysis includes:

- Individual treatment unit diagnosis completed by Helena National Forest personnel and last updated in fall 2009
- Formal stand exam data collected for selected stands by Helena National Forest personnel
- Forest Inventory and Analysis (FIA) “grid intensification” sample plot data collected by the HNF contained in the Field Sampled Vegetation database (FSVeg)
- Informal exam data collected, and stand diagnosis data collected and produced during the fall of 2009 and 2010 by HNF personnel
- Site visits during the summer of 2010
- Past management activity data located in the Forest Service Activity Tracking System (FACTS) database
- GIS spatial data acquired from the Helena National Forest including:
    - VMAP spatial data including classification for tree dominance type, tree canopy cover class, and tree diameter
    - Helena National Forest Plan (USDA Forest Service 1986) Management Area boundaries
    - 2001-2010 aerial insect and disease detection (ADS) survey data
    - Project area boundary
    - Historic fire activities
    - Past management activities
    - Old growth

- Other documents as referenced in the Stonewall Vegetation Project Old Growth and Snag report (Amell and Higgins 2014).

Assumptions

Ecosystems are dynamic, American public desires and expectations change, and climatic conditions change. These factors require that a number of assumptions, from great to small, be made in any analysis. In this analysis we do not include as assumptions that natural processes which are certain to happen would continue to happen. For example, succession is a natural process constantly occurring due to differences in plants abilities to colonize, survive, grow, and propagate as conditions change. The process of succession would always happen and we do not consider it an assumption that it would do so. We do include as assumptions factors such as climate change-the direction, magnitude, and effects of which cannot yet be considered as “known”-and the occurrence or non-occurrence of disturbances such as wildfires which can modify the direction of succession.

Assumptions we make in this analysis applying to both old growth and snags include:

- Management direction displayed above would continue indefinitely into the future
- In the long-term time frame of the analysis, no additional major disturbances, such as wildfire or bark beetle epidemics would occur: the analysis concerns future risk and probable effects if the disturbance occurs and is not a future projection of the occurrence of any disturbance
- Climate change has occurred to some degree and will continue to occur in the future. Ramifications of a changing climate for the project area are likely to be (Karl et al. 2009):
    - More of the winter precipitation will fall as rain
    - Snow levels will raise in elevation
    - Snow melt will occur earlier in the spring
    - The late-spring to summer dry season (fire season) will increase in length
    - Summer dry seasons will be drier and warmer
    - Prolonged drought periods will increase, but their occurrence will probably be variable
    - Storms will become more intense with a larger portion of annual precipitation falling in the heaviest storms
    - Night-time minimum temperatures will increase
    - Growing season and number of frost-free days will increase
    - Wildfires are likely to become more frequent and the area burned averaged annually likely greater
    - Weather conditions conducive to bark beetle mortality are likely to become more frequent
- The accomplishment time period is estimated to be 2015-2020
- No unforeseen occurrences such as fire, blowdown, or insect mortality would occur from 2010 until the time of implementation

Additional assumptions used for the old growth analysis include:

- Climate changes will most likely bring about some change in site characteristics leading to climax plant community changes, but the direction and magnitude of the changes are unknown and would be very small within the time frame of this analysis

- Minimum stand characteristics found in Green et al. 1992 (errata corrected 2005, 2007, 2008) are appropriate to define old growth in the project area
- Designated old growth does not have to meet minimum tree characteristics described in Green et al. 1992 (errata corrected 2005, 2007, 2008) to be managed as old growth to meet the Forest Plan standard
- Intensive stand examinations provide the best data available for quantifying stand characteristics
- The algorithm (R1 Old Growth Utility, FSVeg) is the best tool available to identify stands that have old-growth characteristics
- Since 10 acres is the minimum old growth stand size in Forest Plan old growth management direction, stands, or combinations of stands, of less than 10 contiguous acres are not designated as old growth for determining Forest Plan compliance, but are included in an assessment of old growth
- FVS modeling can provide a reasonable estimate of the magnitude and direction of proposed treatment effects on stand species compositions, tree diameter distributions and tree establishment
- Stands with old growth characteristics exist outside of 3rd-order drainages. The Forest Plan Desired Future Condition of the Forest (USDA 1986) states that old growth in the first decade "will be well distributed over the forest" and that in the fifth decade that "a good balance will be scattered throughout the Forest." To maintain old growth benefits within the project area outside of the 3rd-order drainages, we are assuming that there is a desire to manage some of the stands within the project area outside of the 3rd-order drainages as old growth

Additional assumptions used for the snag analysis include:

- FIA grid intensification plot data can provide an average of snag numbers at the landscape level in the year the plot data was collected
- Past harvest/regeneration activities would contain no snags
- ADS data provide a reasonable estimate of trees killed by bark beetles at the landscape level
- ADS mortality estimates need to be adjusted remove trees greater than seven inches d.b.h.
- FVS modeling of proposed prescribed burning can provide mortality estimates that can be used to estimate snag additions to landscape-level snag levels
- Adequate snags would be retained to meet Forest Plan standards through implementation of Stonewall Vegetation Project Design Features. In particular, "WL-5" would be applied to intermediate and regeneration units to retain snags in all cutting units to ensure snags are well distributed throughout the project area
- No snags would be created or removed in pre-commercial thin units
- In treatment units where tree removal is followed by prescribed burning a very small degree of mortality from the prescribed burning can be expected to occur, but for simplicity sake in this analysis, we are assuming no mortality in these units of trees greater than seven inches d.b.h.
- In units being prescribed burned, we are assuming no loss due to burning of snags

Helena National Forest Old Growth Identification and Analysis Process

Other information sources use the term "watershed" to denote the area drained by a stream. In this analysis we use the term "drainage" to be consistent with Forest Plan direction. As mentioned above the HNF identifies old growth when drainages are proposed for a management entry that could affect the old growth. The HNF designates old growth primarily where there is stand-level inventory data (stand exam) available to confirm characteristics. Since stand exams are typically completed when vegetation projects are proposed, the majority of these inventories are focused in timber management emphasis areas. Wilderness areas, as well as many roadless areas and non-timber management areas receive few exams. Stand-level inventories have also typically targeted the most productive stands with a high probability of containing commercial timber for sampling which provides an incomplete sample of stands within each third-order drainage analyzed. Due to incomplete sampling, the inventories recorded a minimum amount of old growth.

Following Forest Plan direction, old growth is identified in this process to represent five percent of each 3rd-order drainage. The stream order is a method of numbering streams as part of a drainage basin network where the smallest un-branched mapped tributary is called “first order” and the stream receiving the tributary is called “second order”, and so on (USDA Forest Service 1986). In HNF spatial data, there are two 3rd-order drainages within the project area, “0203” which encompasses about 4,849 acres and “0204A” which encompasses about 6,834 acres. The rest of the project area (11,198 acres) is not within a 3rd-order drainage. The two 3rd-order drainages comprise about 49 percent of the project area, with 51 percent of the project area not within a 3rd-order drainage. In this analysis we analyzed old growth for each 3rd-order drainage to show consistency with the Forest Plan, and we evaluated old growth for the entire project area (including outside of 3rd-order drainages) to show that old growth is being retained at a landscape-level.

Based upon available data, stands at least 10 acres in size (or smaller in adjacent groups) are designated first. If these areas do not constitute five percent, additional areas are designated which may not meet old growth definitions yet, but are the “next best thing” to be managed to meet them in the future. Old growth is not a static condition and can be affected by insect and disease activity, wildfires, and forest management. When stand characteristics change substantially, the stand is no longer considered old growth. Stands designated as old growth are reviewed at the project scale when treatments are proposed including a review of proposed treatment units for old growth characteristics. For further details of the HNF old growth analysis see Milburn (2009).

Identifying and designating old growth on the HNF progressed through several steps:

1. Stand exams were used to identify stands with old growth characteristics. The R1 Inventory Analysis Team ran a FSVeg utility that compared exam data with activity data in FACTS to determine if exams were still representative, that is they did not have an activity was more recent than the exam. Those exams without more recent overlapping activities were considered “clean.” The “clean” exams list was most recently updated against FACTS in 2007. Clean stands for the HNF were then run through the R1 Old Growth Utility in FSVeg to identify old growth. This report identified stands that meet minimum criteria (Green et al.1992, errata corrected 2005, 2007, 2008). The data report included an estimate of years until stands could become old growth. This utility can also be used to analyze FIA data to determine old growth quantity at broad scales.
2. The results of the previous process were combined with other GIS layers such as 3rd-order drainage boundaries, past activities, insect aerial detection surveys (ADS), and the project area boundary. Stands that the previous process indicated met minimum old growth characteristics were checked to determine if any changes have occurred since the exam. A combination of photo interpretation and walkthrough exams was used to validate the results in the third-order drainage. Stands outside of the 3rd-order drainage did not receive this validation step. Stands that had changes to minimum characteristics were not counted as old growth. Non-adjacent stands smaller than 10 acres were eliminated from the 3rd-order drainage at this time from consideration for meeting Forest Plan Standards, however these small areas were checked against proposed treatments to determine if any old growth would be affected by the proposal. No such overlaps occurred in the 3rd-order drainage.

Small stands outside of the 3rd-order drainage were not eliminated from the data nor were they removed from potential treatment units.

3. Each 3rd-order drainage affected by the proposal was assessed. If the drainage had at least five percent of stands meeting minimum old growth characteristics, these stands were used to select approximately five percent to designate for old growth management under the Forest Plan. Old growth in excess of five percent was not designated to manage for old growth, but remained identified for purposes of habitat analysis and assessing if treatments overlapped with existing old growth. Stands were selected for old growth management favoring: (1) the oldest, (2) largest stands or greatest contiguous area, (3) elevation below 6000 feet, (4) riparian areas, (5) management areas other than T-1 through T-5, and (6) non-pine forest types in areas heavily infested with mountain pine beetle. In this process, old growth characteristics discussed by Green et al. 1992 (errata corrected 2005, 2007, 2008) were the primary designation criteria with the other Forest Plan prioritization criteria used as a guide when possible.
4. In drainages with less than 5 percent old growth identified in the previous step, additional areas to manage as old growth were selected as the "next best thing", using the same criteria (oldest, largest, below 6000 feet elevation, riparian, non-timber emphasis). Other factors such as wildlife habitat needs were considered. The inventoried stands that best meet the most considerations were selected to designate for old growth management.
5. Proposed treatment units were evaluated to assess whether they could be old growth, particularly where there is no stand exam available for the assessment described above in the first step. Specialists used photo interpretation to identify other old growth, followed by a sample of walkthrough exams. Additionally, HNF personnel conducted diagnoses and informal plots in all units to identify where more intensive exams were needed to determine if the stand was old growth. Diagnosis plots were informal in number and placement, but measured minimum old growth criteria. Areas that had at least one of the old growth minimum criteria, were at least 10 acres, and had no past exam were scheduled for an intensive exam. Based upon the intensive exams, two proposed treatment units (2 and 46) were considered to be partially composed of stands (41502089 and 42303130 respectively) that qualified as old growth.

Based on the findings of all the above information, all areas of old growth identified from steps 1-4 were removed from proposed treatment units within the 3rd-order drainage. However, outside of the 3rd-order drainage there are stands within proposed treatment units in one or both of the action alternatives and one stand is partially within the 3rd-order drainage. These stands are discussed individually starting on page 225.

In the above process, to meet Forest Plan direction, old growth is identified and designated at the stand level and analyzed at the 3rd-order drainage level. It can also be informative to estimate the amount of old growth on a broad landscape scale. Utilizing FIA grid intensification plots, the HNF Summary Database can be used to make statistically viable estimates of old growth presence on the HNF, but from the FIA plots alone, the old growth cannot be spatially located. The HNF summary database was also used to depict the abundance of old growth habitat type groups.

About 51 percent of the analysis area is outside of mapped 3rd-order drainages. In this area, we assessed stands identified above in Step 1 using available NAIP imagery, ADS survey data, and available stand exam data to determine if the stands had been impacted by the recent mountain pine beetle outbreak and so would no longer qualify as old growth. Stands considered not impacted by the outbreak to a level that would not be considered old growth, were retained and discussed, and are displayed in this evaluation of old growth for the landscape assessment.

Snag Analysis Process

The Helena Forest Plan provides for snags to be "managed at 70 percent of optimum (average 2 snags per acre) within each 3rd-order drainage" (emphasis added). In this analysis, we discuss snags within each of the two 3rd-order drainages and for the entire project area. The two 3rd-order drainages together comprise about 49 percent of the project area.

The snag analysis process involves three steps:

Average snags per acre present in 2008 by d.b.h. class were computed from FIA grid intensification plot data and a "base level" of snags computed for each third-order drainage and the project area

Average total snags created by insect activity from 2008 to 2010 for each third-order drainage and for the whole project area were computed from ADS spatial and tabular data and adjusted using FIA grid intensification plot data to represent only snags 7 inches or larger. The adjusted snag numbers were then added to the base level.

FVS was used to model mortality for prescribed-burn only treatments which was then applied to treatment areas to compute snag additions due to the burns.

Following the assumption that snags would be reduced to 2 snags per acre to meet Forest Plan standards (Stonewall Vegetation Project Design Criteria WL-5) in mechanical treatments, excepting pre-commercial thinning, we computed the average snag reduction due to the treatments and applied that to the third-order drainage and project area estimates.

Affected Environment

Existing Condition

Snags

In 2007 and 2008, the Helena National Forest measured "FIA grid intensification" plots within the Stonewall project area. These plots include all tree mortality through 2008. Within all plots in the project area, there was an average of about 40 snags per acre greater than or equal to 7 inches d.b.h. (table 54) in 2008. For this analysis, we used this average as a uniform 2008 "base level" of snags per acre greater than 7 inches d.b.h. for the 3rd-order drainages and for the project area.

Table 54. Snags per acre by d.b.h. class from 2008 FIA intensification plot data

d.b.h. Class	Average Number of Snags per Acre
≥ 7" and < 12"	26
≥ 12" and < 20"	13
≥ 20"	1
Total	40

The base level average cannot be directly applied to the entire 3rd-order drainage areas or project area forested land because past harvest/regeneration activities cannot be expected to have many, if any, snags and no FIA grid intensification plots were located within past harvest/regeneration activities. Since past harvest/regeneration activities are not represented in the FIA grid intensification plots, the base level snag estimates would overestimate snag numbers. For this exercise, we assumed that past harvest/regeneration activities would have no snags and adjusted FIA grid intensification plot snag estimates down based upon the proportion of the area in 3rd-order drainage and the project area that was treated by past harvest/regeneration activities. Our adjusted average 2008 snags per acre (SNA) greater than 7 inches was: 36 SNA for drainage 0203, 35 SNA for drainage 0204A, and 35 SNA for the entire project area.

Since the adjusted FIA grid intensification plot snag estimates from the previous step did not take into account mortality from 2008 to 2010, we then adjusted the 2008 average SNA for each 3rd-order drainage, and for the project area, to take into account mortality in the years 2009 and 2010 using Aerial Damage Survey (ADS) data. To show the magnitude of the mortality, figure 51 displays accumulative mortality from ADS spatial data for the years 2009 and 2010 by estimated dead trees per acre (TPA) class. ADS mortality estimates, however are ocular estimates of dead tree numbers of all sizes, although it is reasonable to conclude that the estimates are largely of overstory trees because of the difficulty of seeing and estimating dead tree numbers in stand mid-stories and understories from the air.

For this analysis, we computed a weighted average ADS SNA for each 3rd-order drainage and for the project area. Weighted average tree mortality for the years 2009 and 2010 are: 9 trees per acre (TPA) for drainage 0203, 7 TPA for drainage 0204A, and 8 TPA for the entire project area. We then adjusted the ADS weighted averages using FIA grid intensification plot data. In the FIA grid intensification plots, 68 percent of the dead pine trees were 7 inches or larger in d.b.h. The adjusted weighted average tree mortality for the years 2009 and 2010 are: 6 trees per acre (TPA) for drainage 0203, 5 TPA for drainage 0204A, and 5 TPA for the entire project area. Adding the ADS estimated mortality to that estimated from FIA Intensification plots indicates that snag numbers greater than or equal to 7 inches in 2011 to be: 42 SNA for drainage 0203, 41 SNA for drainage 0204A, and 40 SNA for the entire project area.

The estimates given above are most likely underestimated. At the time of this initial analysis, 2011 ADS data was not available which would increase average snag levels. The ADS estimates may also have underestimated snag numbers in individual stands. Stonewall project proposed treatment units were visited during 2008 and revisited in 2009. Assessments of stand conditions including snag estimates for individual units can be found in project records and are summarized here. Snag estimates for trees greater than 6 or 7 inches d.b.h. range from zero to “lots.” Of the units where snag numbers were estimated, snags range from 0 to 400 with an average of about 160 snags per acre. Note that the individual stand estimates from site visits are included here only to establish the context that the snag numbers discussed in this analysis are most likely underestimated and are not included in the estimates discussed.

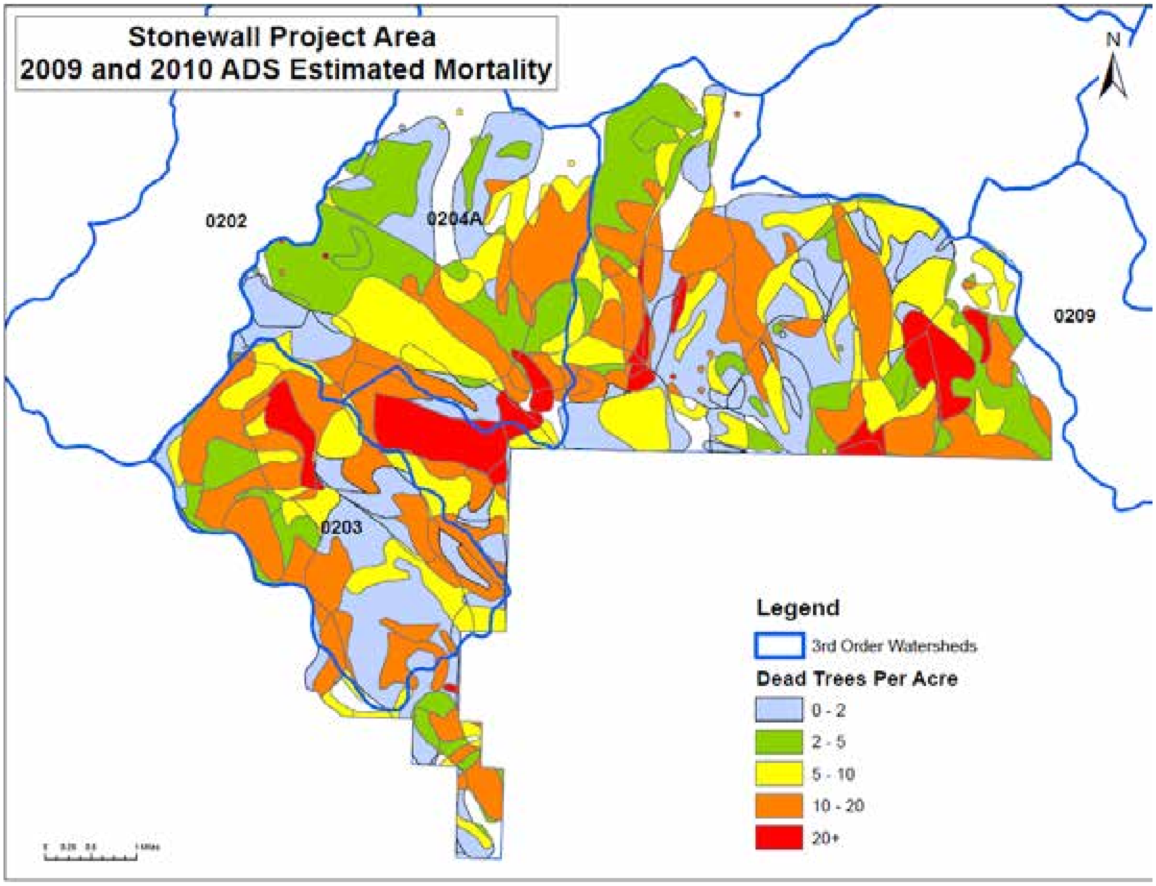


Figure 51. Aerial damage survey estimated mortality for 2009 and 2010

The best currently available information, indicates that at least partially due to recent bark beetle activity, snag levels average over twenty times the minimum levels required by the Forest Plan in the two 3rd-order drainages analyzed and over the Stonewall Vegetation Project area. Due to the recent bark beetle mortality, snags are very abundant in the Stonewall Vegetation Project area.

Old Growth

Old Growth within 3rd-order Drainages

Five percent of the 0203 and 0204A 3rd-order drainages were designated to be managed as old growth. Five stands in 0203 (247 acres) were designated and 15 in 0204A (345 acres, table 55 and table 56). Note that in table 55, one stand less than 10 acres in size was designated as old-growth management because it is adjacent to another designated old-growth stand.

Table 55. 3rd-order drainage designated old growth data

Drainage ID	Stand ID	Old Growth Type	Habitat Type Group	Elevation	Habitat Type	Vertical Structure	Currently OG	Acres
0203	41403075	DF	Cool and Moist to Wet	6131	SAF/menziesia	C	Yes	42
0203	41403071	DF	Cool and Moist to Wet	5475	SAF/menziesia	1	Yes	31
0203	41403093	DF	Cool and Wet	5541	SAF/queencup beadlily	C	Yes	38
0203	41403058	DF	Cool and Wet	5322	SAF/queencup beadlily	C	Yes	23
0203	41403048	ES-SAF	Cool and Moist to Wet	6147	SAF/menziesia	C	Yes	113
0204A	42301052	DF	Cool and Moist	5192	SAF/twinflower	C	Yes	36
0204A	42301033	ES-SAF	Cool and Moist to Wet	5751	SAF/menziesia	1	No	18
0204A	41401087	ES-SAF	Cool and Wet	5730	SAF/queencup beadlily	1	No	14
0204A	41401084	ES-SAF	Cool and Wet	6192	SAF/queencup beadlily	2	No	18
0204A	41401083	ES-SAF	Cool and Moist to Wet	6099	SAF/menziesia	C	Yes	20
0204A	41401099	ES-SAF	Cool and Moist to Wet	6464	SAF/menziesia	C	Yes	37
0204A	41401054	ES-SAF	Cool and Wet	5638	SAF/queencup beadlily	C	Yes	19
0204A	42301002	ES-SAF	Cool and Wet	5735	SAF/queencup beadlily	2	Yes	4
0204A	41401051	ES-SAF	Cool and Wet	5855	SAF/queencup beadlily	3	No	19
0204A	42303048	DF	Cool and Dry to Moist	6226	SAF/beargrass	2	Yes	18
0204A	42302109	DF	Cool and Dry to Moist	5746	SAF/beargrass	C	Yes	24
0204A	42303035	DF	Cool and Dry to Moist	6172	SAF/beargrass	2	No	13
0204A	42302096	DF	Cool and Moist to Wet	5793	SAF/menziesia	C	No	33

Drainage ID	Stand ID	Old Growth Type	Habitat Type Group	Elevation	Habitat Type	Vertical Structure	Currently OG	Acres
0204A	42302091	ES-SAF	Cool and Wet	5895	SAF/queencup beadlily	C	No	23
0204A	42302095	DF	Cool and Dry to Moist	5902	SAF/beargrass	C	No	49

1 – Single-story
2 – Two-story
C – Multiple-story
DF – Douglas-fir
ES-SAF – Engelmann spruce-subalpine fir
SAF/queencup beadlily – subalpine fir-twincup beadlily
SAF/beargrass – subalpine fir-beargrass
SAF/menziesia – subalpine fir-
SAF/twinflower – subalpine fir-twinflower

Designated old growth is Douglas-fir and Engelmann spruce-subalpine fir (table 56). All of the designated old growth is in subalpine fir habitat types. On these habitat types the Douglas-fir can be considered seral and the Engelmann spruce-subalpine fir old growth can be considered late-seral to climax. About 63 percent of the old growth designated is Douglas-fir and 38 percent is Engelmann spruce-subalpine fir.

Table 56. 3rd -order drainage designated old growth, type and acres

Third-Order Drainage	Old Growth Type	Acres
0203	DF	134
	ES-SAF	113
	Total	247
0204A	DF	173
	ES-SAF	172
	Total	345

Unit 46 of the Stonewall Vegetation project crosses a 3rd-order drainage boundary. This unit includes 43 acres that meet old-growth characteristics, field verified by 2010 stand exam (table 57). These stands are part of other old growth considered in this analysis and are not part of the designated old growth to meet Forest Plan direction. The Stonewall Vegetation Project proposes treatment in the 43 acres of unit 46 that meet old-growth characteristics.

Table 57. Other field verified old growth within a 3rd-order drainage

Stand ID	Unit	Old Growth Type	Habitat Type Group	Habitat Type	Vertical Structure	Acres*
42303130	46	DF	Cool and Moist	SAF/twinflower-twinflower	C	163

* Acres cited here are delineated stand acreages and not proposed unit acreages, the unit areas include more than one stand.

** Stand 41502046 includes 43 acres within the 3rd-order drainages, however, the 43 acres of this stand is not part of the 5 percent designated old growth to meet the Forest Plan direction. Approximately 120 acres of stand 41502046 is located outside 3rd-order drainages.

Figure 32 displays the old growth in the project area, for both designated stands within 3rd-order drainages and "Other Old Growth" that is not designated or is located outside 3rd-order drainages.

Old Growth Outside 3rd-order Drainages

About 51 percent of the Stonewall project area is outside 3rd-order drainages with approximately 611 acres of stands with old growth characteristics (175 acres were field verified by 2010 stand exam). The 611 acres of old growth is about five percent of the project area located outside 3rd-order drainages. Although not covered explicitly by Forest Plan direction, we recognize old growth is a landscape feature and in this analysis identify and assess the availability of old growth stands, and analyze effects as if these stands were to be managed for old growth.

Stand 41502089 partially forms Unit 2 and is in the warm-and-very-dry habitat group for which the minimum number of trees greater than 17 inches d.b.h. required to be classified as old growth is four. Stand 41501130 partially forms Unit 46 and is in the cool-and-moist habitat group for which the minimum number of trees greater than 17 inches d.b.h. required to be classified as old growth is seven.

The lower portion of proposed prescribe burn Unit 81 contains three stands that, from available stand exam data, could potentially qualify as old growth (table 58). These three stands are within the warm-and-moist habitat type group in which the minimum number of trees greater than 19 inches d.b.h. required to qualify for old growth is five.

Table 58 displays the old-growth stands in the project area located outside 3rd-order drainages.

Table 58. Old growth stands outside 3rd-order drainages

Unit ID	Stand ID	Old Growth Type	Habitat Type Group	Habitat Type	Vertical Structure	Acres
	41502023	DF	Cool and Dry to Moist	SAF/beargrass	C	10
81	42201139	DF	Warm and Moist	DF/snowberry-pinegrass	C	37
81	42201147	DF	Warm and Moist	DF/snowberry-pinegrass	2	53
81	42201152	DF	Warm and Moist	DF/snowberry-pinegrass	2	22
	42202023	ES-SAF	Cool and Dry to Moist	SAF/beargrass-huckleberry	C	29
	42202038	DF	Cool and Dry to Moist	SAF/beargrass-huckleberry	1	86
	42202054	ES-SAF	Cool and Moist to Wet	SAF/menziesia	C	76
	42202067	DF	Cool and Moist to Wet	SAF/menziesia	C	100
	42301068	DF	Cool and Moist	SAF/twinflower	1	8
	42301087	DF	Cool and Moist	DF/huckleberry	C	15
2	41502089	DF	Warm and Very Dry	DF/snowberry-bluebunch wheatgrass	C	55
46	42303130	DF	Cool and Moist	SAF/twinflower-twinflower	C	120

1 – Single-story

2 – Two-story
C – Multiple-story
DF – Douglas-fir
ES-SAF – Engelmann spruce-subalpine fir
SAF/queencup beadlily – subalpine fir-twincup beadlily
SAF/beargrass – subalpine fir-beargrass
SAF/menziesia – subalpine fir-
SAF/twinflower – subalpine fir-twinflower
Acres cited here are delineated stand acreages and not proposed unit acreages, the unit areas include more than one stand. Stand 41502046 includes 43 acres within the 3rd-order drainages, however, the 43 acres is not part of the five percent designated old growth to meet the Forest Plan direction. Approximately 120 acres of stand 41502046 is located outside 3rd-order drainages.

The following discussions display a more detailed breakdown of the current diameter distribution in Units 81, 2 and 46, proposed for treatments. Diameter information is displayed by species present (Douglas fir [DF], Engelmann spruce [ES], subalpine fir [SAF], ponderosa pine [PP], lodgepole pine [LP]).

Figure 52 displays the current diameter distribution for Stand 42201139, which forms part of Unit 81. The stand currently has about 118 trees per acre (TPA) of which 31 are greater than 19 inches in diameter at breast height (d.b.h.).

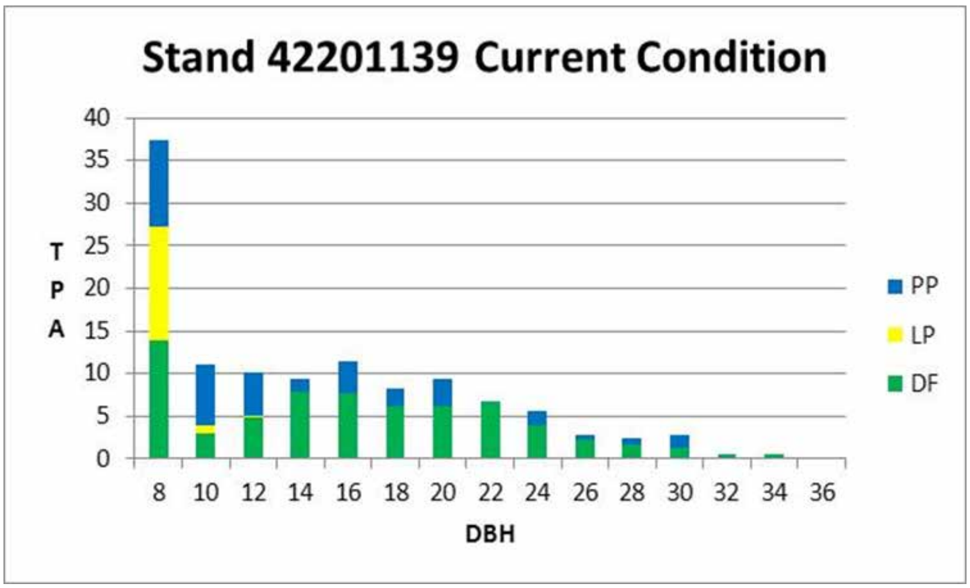


Figure 52. Stand 42201139 (Unit 81) current condition

Figure 53 displays the current diameter distribution for Stand 42201147, which also forms part of Unit 81. The stand currently has about 498 trees per acre (TPA) of which 18 are greater than 19 inches in diameter at breast height.

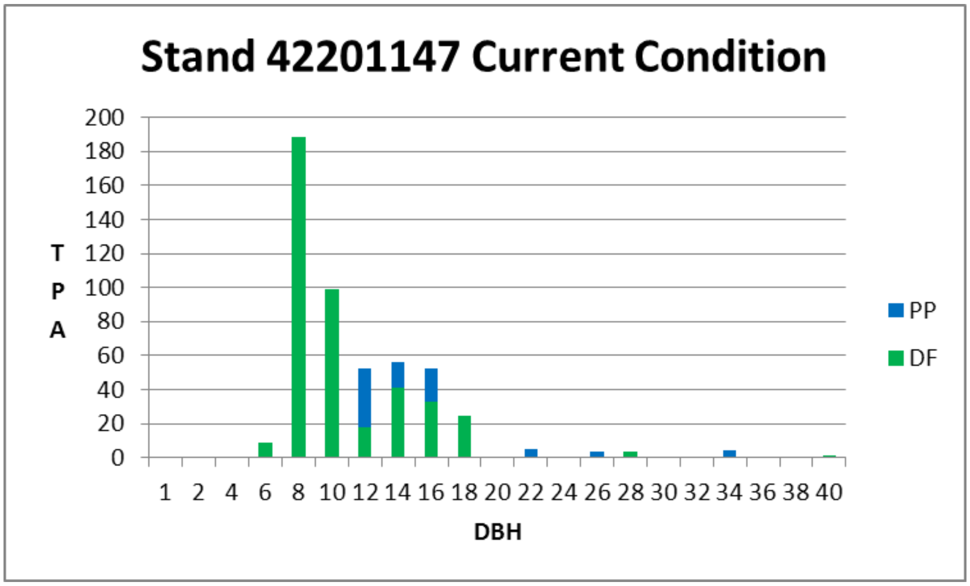


Figure 53. Stand 42201147 (Unit 81) current condition

Figure 54 displays the current diameter distribution for Stand 42201152, which also forms part of Unit 81. The stand currently has about 62 trees per acre (TPA) of which 29 are greater than 19 inches in diameter at breast height.

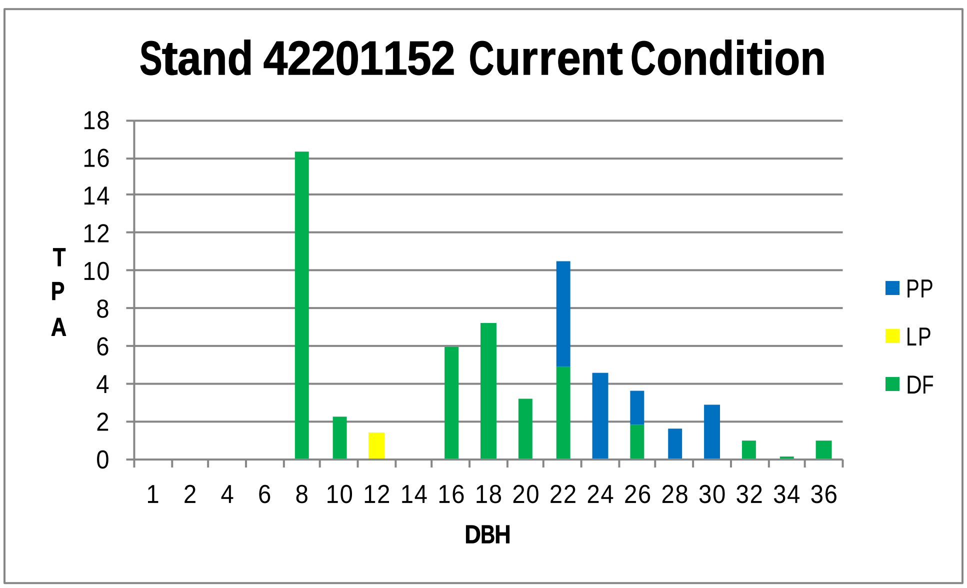


Figure 54. Stand 42201152 (Unit 81) current condition

Figure 55 displays the current diameter distribution for Stand 41502089, which forms part of Unit 2. The stand currently has about 317 TPA of which about 20 are greater than 17 inches d.b.h. Note that the relatively large number of trees in the 1-inch d.b.h. class is not being displayed to better display the distribution in larger trees.

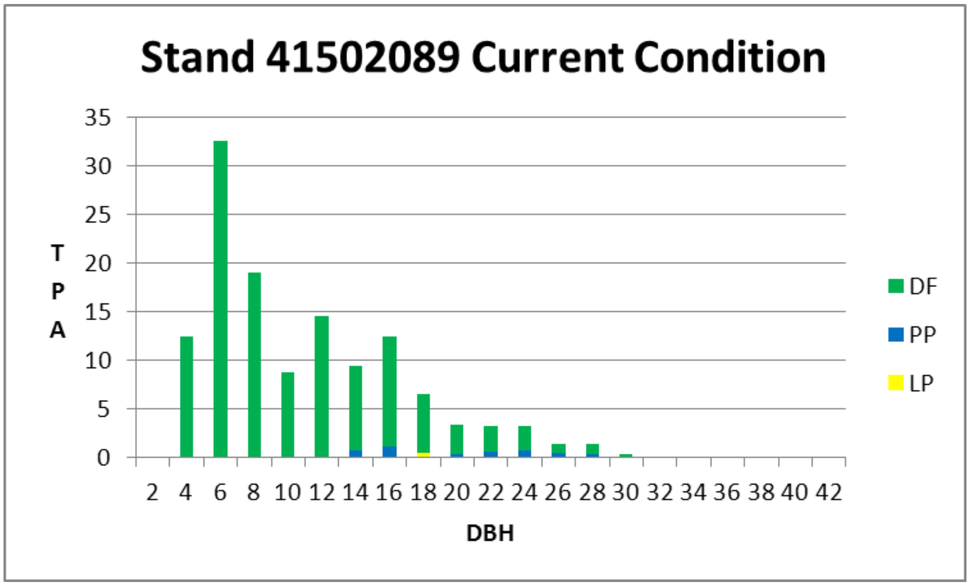


Figure 55. Stand 42201089 (Unit 2) current condition

Figure 56 displays the current diameter distribution for Stand 42303130, which forms part of Unit 46. The stand currently has about 1,442 TPA of which about 13 are greater than 17 inches d.b.h. Note that the trees in the smallest diameter class are not being shown so that larger trees can be better displayed.

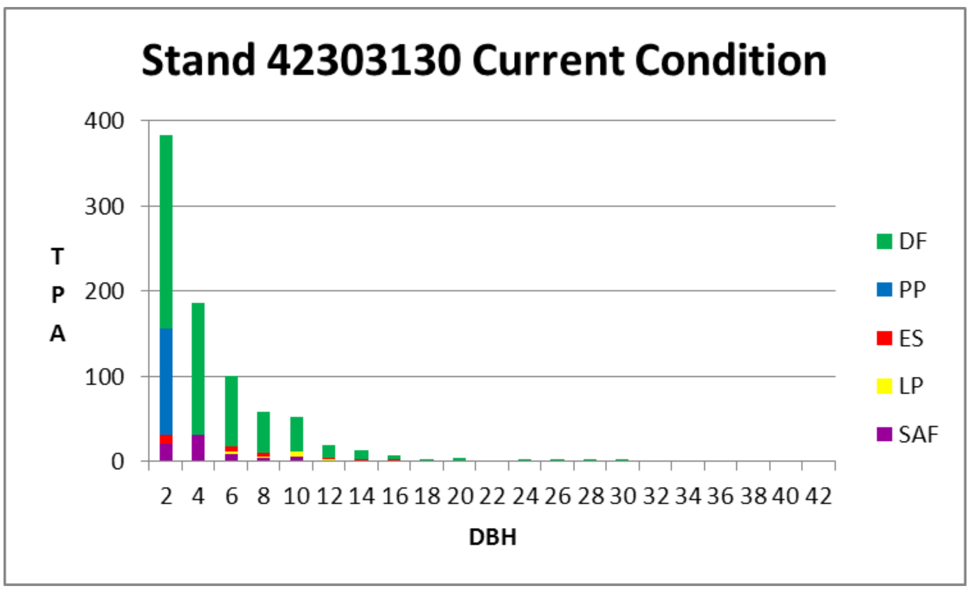


Figure 56. Stand 423031130 (Unit 46) current condition

Environmental Consequences

Spatial Context for Effects Analysis

The spatial scales used in this analysis are the two 3rd-order drainages within the project area, for Forest Plan Consistency old growth and snags, the project area for landscape scale evaluations, and for selected individual proposed treatment areas, the individual stand. We chose the project area as the largest spatial scale for this analysis because it includes all Forest System land that: (1) includes the proposed treatment areas, (2) is bounded on the north, northwest, and west sides by drainage divides, and (3) at about 24,000 acres, is sufficiently large to analyze and discuss effects to forest vegetation on a landscape-level without 'diluting' the magnitude of the effects with a large area.

Temporal Context for Effects Analysis

The year 2010 is the existing condition baseline used for this analysis. Proposed mechanical treatment stands were examined in fall 2009 and 2010, briefly visited in summer 2010, and the last ADS survey used in this analysis was done in 2010. Short-term effects refer to effects over the 10-year period from the time the activity would be accomplished estimated between 2015-2020, and long-term effects refers to effects from 10 to 50 years from the time the activity would be accomplished. All pertinent past activities and events are incorporated into the previous existing condition discussion. In the cumulative effects analysis that follows, cumulative effects are discussed as changes in the existing condition due to present and future activities, including the effects of the alternative being discussed. Connected Actions, Past, Present, and Foreseeable Activities

Past Activities

Past activities that have shaped the existing condition discussed and displayed in this document include: (1) 3,872 acres of harvest/regeneration treatments, (2) 373 acres of other harvests cutting, (3) 822 acres of pre-commercial thinning, and (4) 7,922 acres of fuels treatments from 1950 to present (Amell and Klug 2015), although some of these treatments were on the same area and so the acreages are not accumulative. In addition to the management actions, vegetation has been shaped by: (1) 87 acres in the Snow/Talon Fire (2003), (2) 261 acres in the Keep Cool Fire (2006), and (3) insect and disease activity as discussed previously and in the Stonewall Vegetation Project Silviculture Report (Amell and Klug 2015). Other past actions, such as livestock grazing and recreational activities have played a small role in shaping forest vegetation in the project area, or played a localized role. As mentioned above, these activities have been considered in describing the current condition.

Present and Foreseeable Activities

All past, ongoing and foreseeable projects identified by the HNF for possible consideration in this analysis are displayed in volume 2, appendix C. Many of the activities listed are not considered in this analysis because they are: (1) outside of the analysis area used in this analysis, or (2) have no effect on snags and old growth addressed in this analysis, or (3) have such a small effect on snags and old growth that they are inconsequential to the analysis.

Activities currently ongoing in the project area considered in this analysis are displayed in volume 2, appendix C.

Effects Common to All Alternatives

Snags

The forested landscape will experience additional bark beetle mortality from the ongoing mountain pine beetle (MPB) epidemic. The levels of additional mortality are a matter of speculation, but available research indicates that mountain pine beetle epidemics continue until the available bark beetle habitat is sufficiently reduced that epidemic levels can no longer be sustained (Cole and Amman 1969, Cole and Amman 1980, Klein et al. 1978, Mitchell and Preisler 1991). Mountain pine beetles strongly favor infesting the trees of larger diameter each year and over the life of the infestation infesting smaller trees each year until the average host tree diameter declines to a point that the tree habitat cannot produce sufficient numbers of beetles to maintain the outbreak (Cole and Amman 1969, Cole and Amman 1980). The outbreaks are relatively short, lasting about 6 years (Cole and Amman 1969, Cole and Amman 1980).

Given the magnitude of the mortality that has occurred in the project area as of this writing, we suspect that the epidemic is declining.

The lodgepole pine snags will start falling in 3 to 5 years after death (Bull 1983, Mitchell and Preisler 1998). Snag fall rates depend on tree species, tree size, cause of death, and environmental conditions that could affect the speed of bole decay (Bull 1983, Mitchell and Preisler 1998). For lodgepole pine, Bull (1983) found that eight years after death about 75 percent of the snags less than 25 cm had fallen and 42 percent of the snags greater than 25 cm had fallen. Mitchell and Preisler (1998) in their study of mountain pine beetle killed snags in Oregon found that tree size was not a factor in unthinned stands and that in unthinned stands, 50 percent were down in 9 years and 90 percent were down in 14 years.

In the short- term, snag numbers would be very high, but in the long-term snag numbers would decline greatly as the lodgepole pine snags fall down.

Old Growth

Effects to designated old growth in the two 3rd-order drainage are the same under all alternatives because no activities are proposed in designated old growth in these drainages. Following the process described above, about five percent of each 3rd-order drainage is designated to manage as old growth. All old growth would continue to develop successionally under all alternatives. Changes would be slight in the short term, but could be substantial in the long term. Single-story and two-story stands would become more multi-story. Closed canopies would remain closed, and open stands would become closed over time. Down woody fuels would continue to accumulate.

About 68 percent of the designated old growth is Douglas-fir type. With continuing succession, more small trees would become established with the species composition trending toward subalpine fir (Fischer and Clayton 1983). These stands are susceptible to Douglas-fir beetle (DFB), western spruce budworm (WSB), and root disease. ADS data appears to indicate that DFB has consistently declined in recent years, while WSB infestation was extensive in 2009, substantially less was recorded in 2010 (Amell and Klug 2015). Douglas-fir beetle tends to infest large and old Douglas-fir and heavily stocked stands. Their impacts can also be affected by weather conditions, for example droughts that reduce host tree vigor. With increasing stocking, tree size and age over time, we can expect DFB to continue to impact the stands to some degree, increasing with the next droughty period. Since forests in the area, including the old growth stands, are progressing toward dominance by Douglas-fir and subalpine fir, we can expect the impacts of WSB to continue if not increase. Diseases would continue to impact stands at current levels.

In the long term, dense forest conditions with multiple-layer stands and increasing surface fuels would support increasingly intense fire behavior and severe fire effects (Buhl 2015). Stand replacement fire would become more likely on the landscape and old growth stands more susceptible to the impacts.

Alternative 1 – No Action

Direct and Indirect Effects

Snags

Under this alternative there would be no direct effects to snag levels. The current conditions described above would not change. The indirect effects of no action would be as described above as effects common to all alternatives.

Old Growth

Under this alternative there would be no direct effects to old growth. The current conditions described above would not change. The indirect effects of no action would be as described above as effects common to all alternatives.

Cumulative Effects

Snags

In the Forestwide Hazard Tree Removal Project, the Forest would cut trees determined to be hazardous within 75 to 175 feet from the edge of the road. About 382 acres proposed for treatment under the Hazard Tree Removal Project within the Stonewall project area. Firewood cutting would also occur in close proximity to open roads and remove some of the available snags.

The hazard reduction treatments would remove snags from about 382 acres, which is two percent of the project area. About one percent of 3rd-order drainage 0203 and two percent of drainage 0204A would be affected. This would reduce a small number of snags within the project area. The effects on each 3rd-order drainage would be of a similar magnitude. Given the large number of snags available—many times the Forest Plan requirements—the effect of the treatment would be slight. The long-term cumulative effects would be as described above for the indirect and direct effects.

Old Growth

The Forestwide Hazard Tree Removal Project did not impact old-growth stands in the 3rd-order drainage. There is one designated old-growth stand within range allotments in the project area. Livestock grazing would have no impact of the old growth nature of the stand. There are no known invasive plant locations within designated old growth, so there would be no effects from herbicide treatments. The cumulative effects of no action for old growth are as discussed above for direct and indirect effects.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Proposed Stonewall Project alternative 2 treatments would impact about 44 percent of drainage 0203, 19 percent of drainage 0204A and 37 percent of the project area. For detailed information concerning the individual treatments see the Silviculture Report (Amell and Klug 2015)

Snags

Impacts of the treatments on standing dead trees would differ, with intermediate and regeneration treatments reducing dead tree numbers and prescribed burns increasing dead tree numbers. In treatment units where tree removal is followed by prescribed burning, we can expect a relatively small degree of mortality from the prescribed burn, but for simplicity sake in this analysis, we are assuming no mortality in these units of trees greater than seven inches d.b.h. In units which are proposed for mixed-severity prescribed burning only, there would be substantial mortality but almost 80 percent of the dead trees would be between seven and 12 inches d.b.h. In prescription group nine which was developed for alternative 3, there would be substantial mortality in understory seedling and sapling trees, but we are assuming in this analysis that there is no mortality of larger trees.

Prescribed fires can burn up snags also, but recently created snags that are in the low snag decay classes are not prone to burn. Horton and Mannan (1988) found in Arizona ponderosa pine forests that snags in decay class IV burned more frequently than lower decay classes, and Stephens and Maghaddas (2005) found that post-treatment density of snags greater than 15 cm d.b.h. in decay class one increased in fire-only and mechanical plus fire treatments but that there were no statistical difference between snag volumes or density in other size and decay classes. These studies indicate that snag losses due to burning would be low and in this analysis we are assuming no loss.

Table 59 displays the number of treatment acres for alternative 2 and percent of area within each 3rd-order drainage and the project area. Snag numbers would be reduced to about two snags/acre in the intermediate and regeneration treatments, and as modeled, increase by about 74 to 76 snags/acre in the moderate severity burns (modeled burn mortality minus ADS mortality), and would not change in the rest of the project area. Post-treatment snag numbers would decrease to about 38 snags per acre in drainage 0203, increase to 47 snags per acre in drainage 0204A, and increase to 46 snags per acre in the project area, which are about 21 to 24 times the Forest Plan minimum requirements.

Table 59. Acres and percent of area within 3rd-order drainage and project area by treatment classes

Treatment	Drainage/Project Area	Acres	Percent of Area
Intermediate and Regeneration	0203	1,210	25
	0204A	218	3
	Project Area	3,100	37
Prescribed Burning	0203	859	18
	0204A	1,050	15
	Project Area	5,463	24

Old Growth

As mentioned previously, proposed Stonewall Project alternative 2 treatments would impact about 44 percent of drainage 0203, 19 percent of drainage 0204A and 37 percent of the project area. No designated old growth would be treated in the 3rd-order drainages (figure 57).

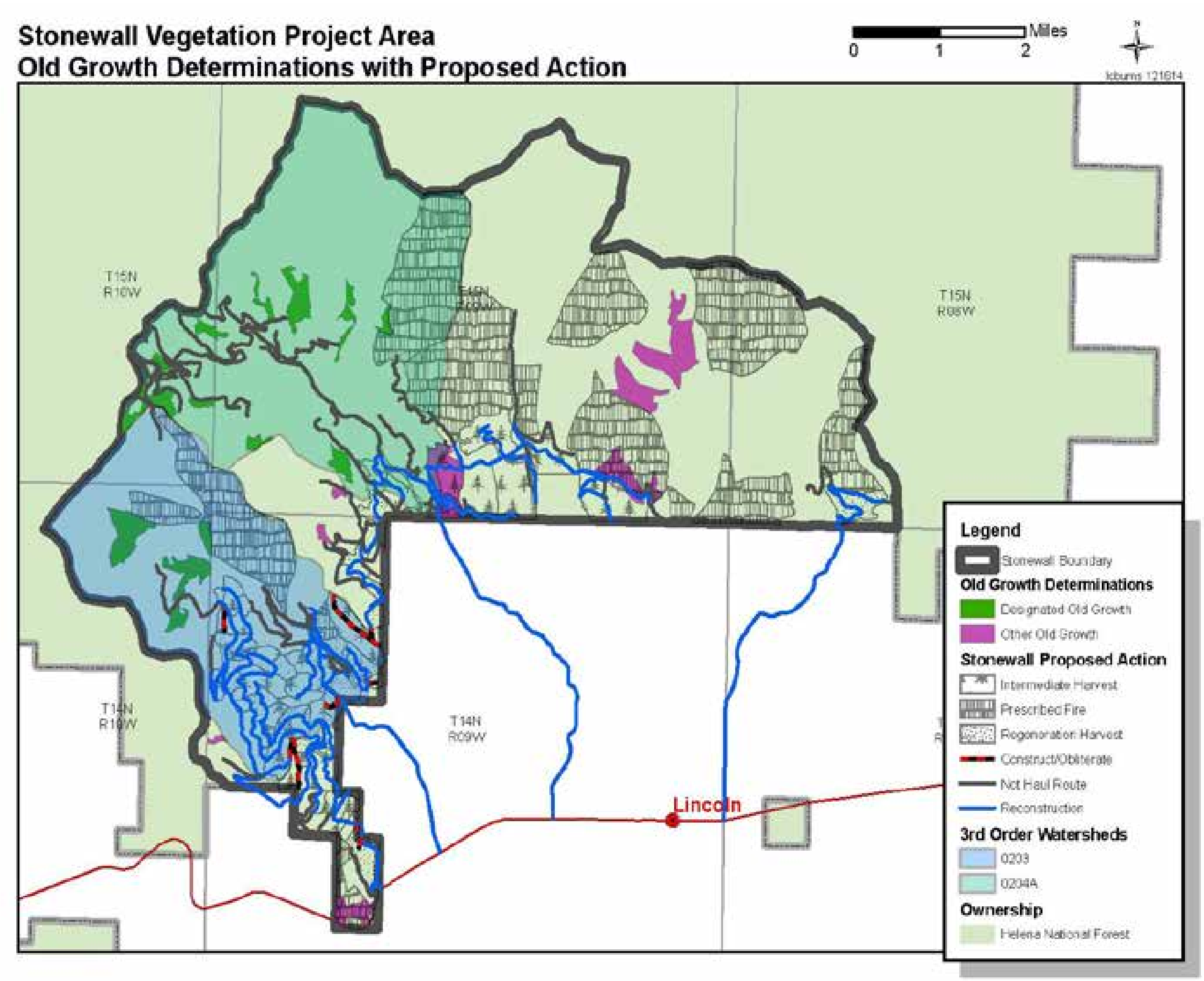


Figure 57. Alternative 2 (proposed action) units and old growth stands

In the project area outside 3rd-order drainages, stand data collected in 2010 indicate that there are two stands having old-growth characteristics within proposed Stonewall Vegetation Project units (Stand 41502089 is within Unit 2, Stand 42303130 is within Unit 46). Less recent stand exam data indicates that there are three stands that may potentially qualify as old growth (Stands 42201139, 42201147, and 42201152) in prescribed burn Unit 81. These stands are displayed in figure 57 as “Other Old Growth.”

A mixed-severity prescribed burn which would create openings less than 30 acres in size is proposed for Unit 81. The three potential old growth stands are in the lower portion of the unit and within those stands the prescribed burn would be conducted as an underburn to minimize mortality in the large trees-see design criteria in the Stonewall Silviculture Report (Amell and Klug 2015).

Figure 58 displays the post-treatment diameter distribution for stand 42201139. Compared to the current condition (figure 52), the prescribed burn would reduce stocking up to the 16-inch d.b.h. class, above which the mortality would be slight. Post-treatment, the stand would still have about 96 TPA of which about 31 TPA would be greater than 19 inches d.b.h. and the stand would still be considered old growth (Green et al. 1992, errata corrected 2005, 2007, 2008).

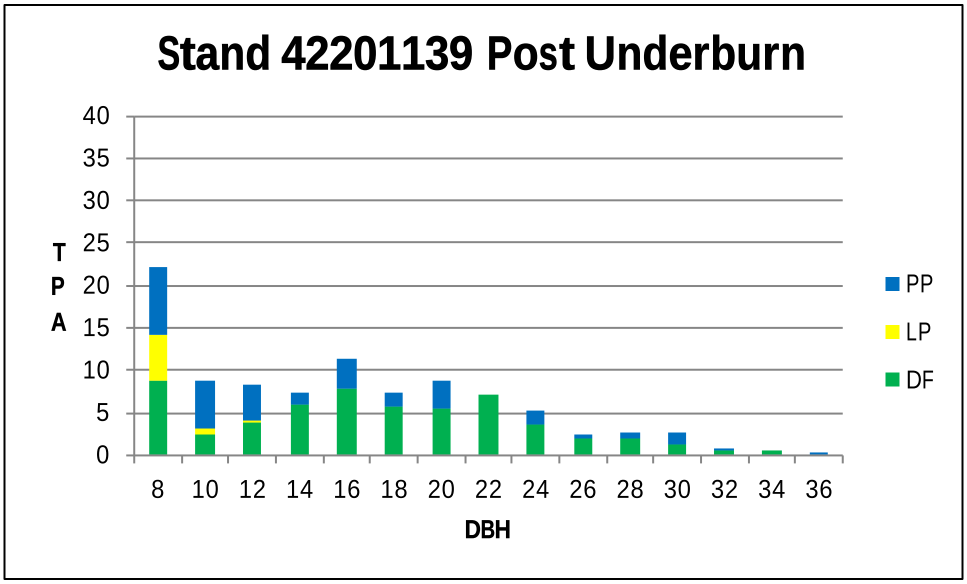


Figure 58. Stand 42201139 (Unit 81) post-underburn condition

Figure 59 displays the post-treatment diameter distribution for stand 42201147. Compared to the current condition (figure 53), the prescribed burn would reduce stocking up to the 22-inch d.b.h. class, above which the mortality would be slight. Post-treatment, the stand would still have about 250 TPA of which about 11 TPA would be greater than 19 inches d.b.h. and the stand would still be considered old growth (Green et al. 1992, errata corrected 2005, 2007, 2008).

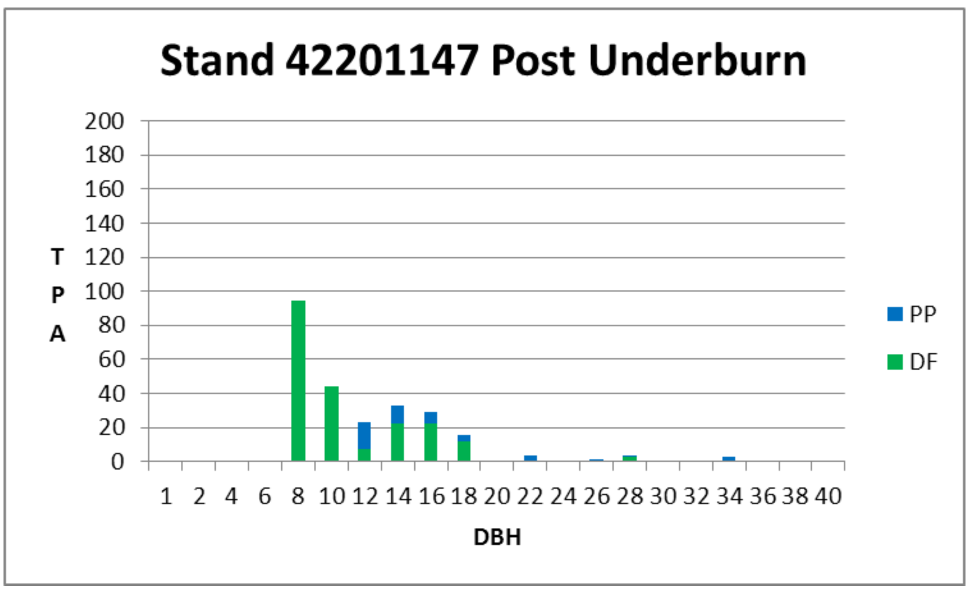


Figure 59. Stand 42201147 (Unit 81) post-underburn

Figure 60 displays the post-treatment diameter distribution for stand 42201152. Compared to the current condition (figure 54), the prescribed burn would reduce stocking up to the 18-inch d.b.h. class, above which the mortality would be slight. Post-treatment, the stand would still have about 53 TPA of which about 28 TPA would be greater than 19 inches d.b.h. and the stand would still be considered old growth (Green et al. 1992, errata corrected 2005, 2007, 2008).

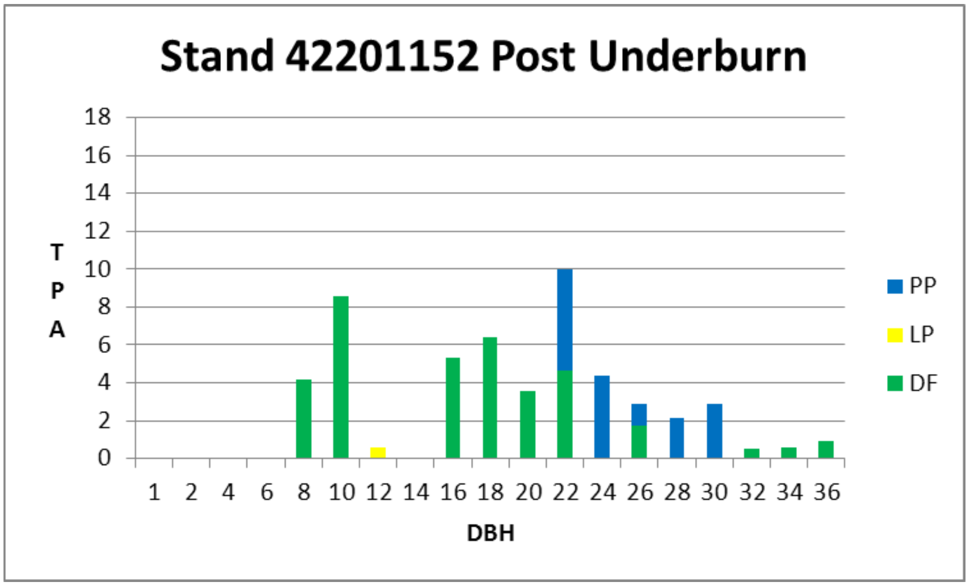


Figure 60. Stand 42201152 (Unit 81) post-underburn

Unit 2 is proposed under both action alternatives for prescribed burning with a low-severity fire. The proposed treatment can be expected to kill many small trees but very few large ones. Figure 61 displays the FVS-modeled post-treatment species composition and diameter distribution for Stand 41502089. The post-treatment diameter distribution, when compared with the current condition in figure 55 indicates that most, but not all, of the very small trees would be killed by the underburning with decreasing numbers of trees killed with increasing d.b.h. Above the 18-inch d.b.h. class mortality would be slight. The stand would have about 17 TPA greater than 17 inches d.b.h. following treatment and would still be considered multiple-canopy old growth.

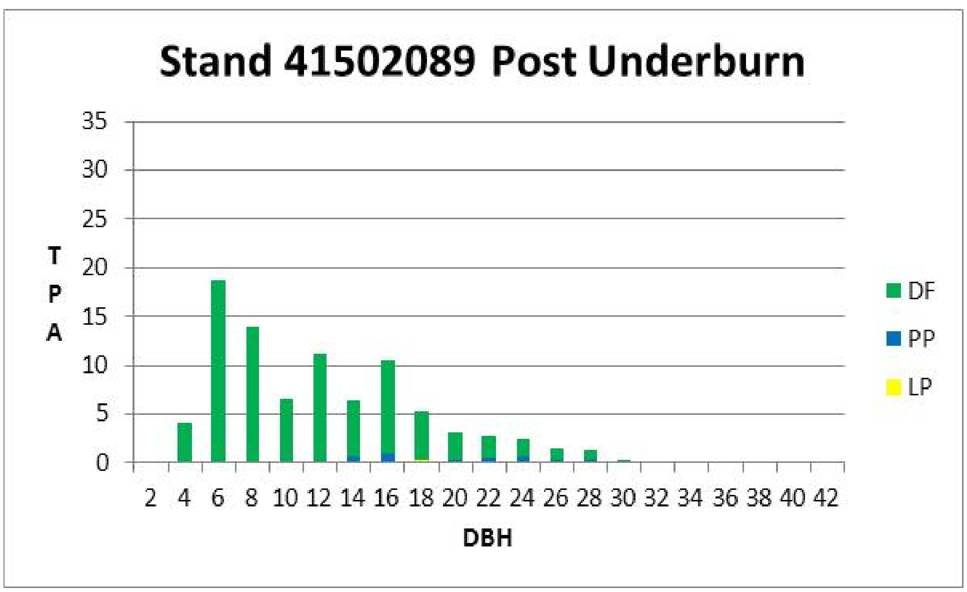


Figure 61. Stand 41502089 (Unit 2) post-underburn

Unit 46 is proposed under this alternative for an intermediate harvest in which both commercial and pre-commercial trees would be thinned, followed by a prescribed underburn as a fuels treatment. The proposed treatments can be expected to remove many small trees but very few large ones. Figure 62 and figure 63 display the FVS-modeled post-treatment species composition and diameter distribution for Stand 42303130. Note that the scale for figure 62 is the same as in the current condition (figure 56) and the scale for figure 63 has been changed to better display the larger trees.

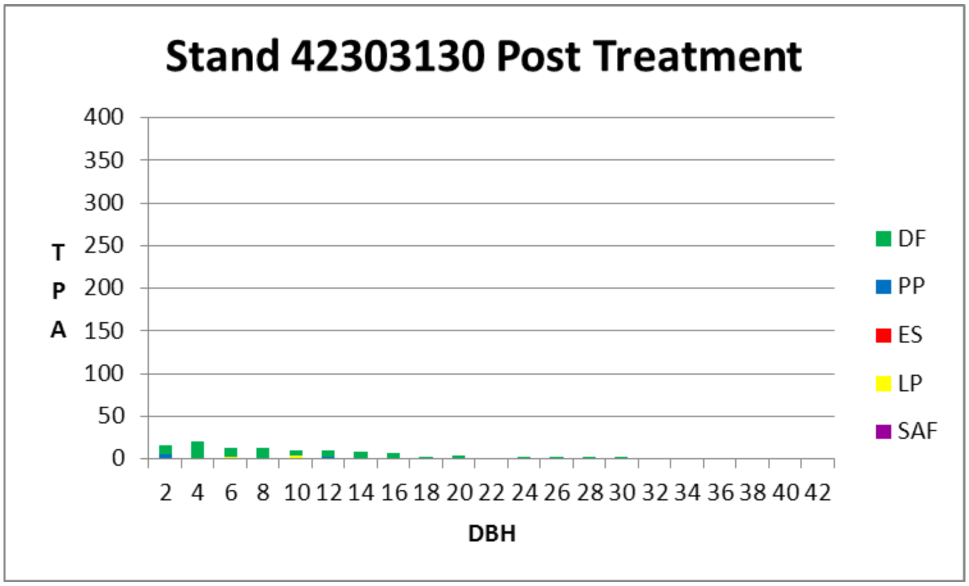


Figure 62. Stand 42303130 (Unit 46) post-treatment

The proposed treatments would remove many, but not all, of the small trees and would create an open stand with a relatively flat diameter distribution. Above the 18-inch d.b.h. class no trees would be removed and mortality from the underburn would be slight. Post-treatment the stand would have about 258 TPA with about 12 TPA greater than 17 inches d.b.h. (note: TPA less than 1 inch d.b.h. are not displayed). Following treatment it would still be considered multiple-canopy old growth.

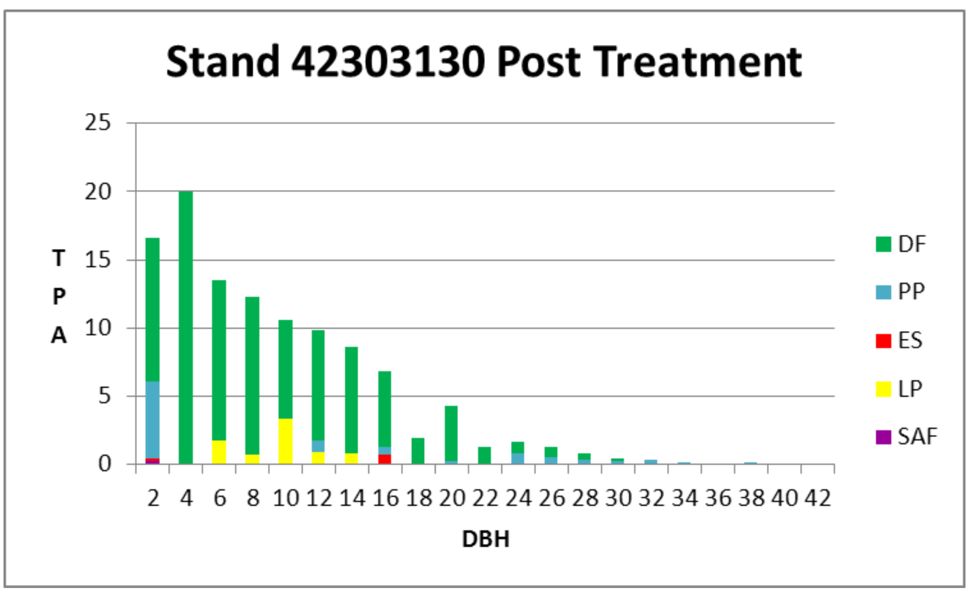


Figure 63. Stand 42303130 (Unit 46) post-treatment

Cumulative Effects

Snags

As mentioned above, the hazard reduction treatment would remove snags along area roads from about one percent of 3rd-order drainage 0203, two percent of drainage 0204A, and two percent of the project area. As described above, under alternative 2, snag levels would still be available at 21 to 24 times the Forest Plan minimum requirements. Cumulative effects would still be that level.

Old Growth

As discussed above, activities other than the Stonewall Vegetation Project that are or may occur within the project area would have no impact on old growth forests. Cumulative effects of this alternative would be as described above for the direct and indirect impacts.

Summary and Forest Plan Consistency

Snags

As discussed and displayed above, given the recent mountain pine beetle epidemic, snags in the project area are abundant and far exceed forest plan requirements. Under alternative 2, the intermediate and regeneration treatments would reduce snag levels to the forest plan requirements within the treatment units and the mixed-severity prescribed burns would increase snag levels within the burn units. After the treatments are done, snag levels would slightly decrease in the 3rd-order drainage 0203, slightly increase in the 3rd-order drainage 0204A, and slightly increase in the project area. They would still exceed 19 times the forest plan requirements.

Old Growth

As discussed and displayed above, no designated old growth in 3rd-order drainages would be treated under this project. Forest Plan direction regarding old growth would be met. Outside of the 3rd-order drainages, three stands (42201139, 42201147, and 42201152) that have old-growth characteristics would be prescribed burned; one stand that has been verified by a recent stand exam (41502089) would be prescribed burned, and one stand that has been verified by a recent stand exam (42303103) would be thinned and prescribed burned.

All of the stands proposed for treatment would be changed by the treatments, with species compositions “pushed” toward dominance by seral fire-tolerant conifers, and stand structures “pushed” to or toward open, but still multi-story, structures with relatively flat diameter distributions. Following treatments, these stands would still qualify as old growth.

Alternative 3

Snags

Snag numbers for alternative 3 would differ slightly from alternative 2, but given the magnitude of the recent mortality and the large number of snags within the analysis area, the difference would be slight. Table 60 displays the number of treatment acres for alternative 3 and percent of area within each 3rd-order drainage and the project area. If snag numbers are reduced to two snags/acre in the intermediate and regeneration treatments, and as modeled, increase by about 74 to 76 snags/acre in the moderate severity burns (modeled burn mortality minus ADS mortality), and don’t change in the rest of the project area, the average snag numbers would decrease to 41 snags per acre in drainage 0203, increase to 47 snags per acre in drainage 0204A, and increase to 48 snags per acre in the project area. Post-treatment snag numbers would still be about 21 to 24 times the Forest Plan minimum requirements.

Table 60. Alternative 3, acres and percent of area within 3rd-order drainage and project area by treatment classes

Treatment	Drainage/Project Area	Acres	Percent of Area
Intermediate and Regeneration	0203	716	15
	0204A	218	3
	Project Area	2,118	9
Prescribed Burning	0203	244	5
	0204A	1,046	15
	Project Area	4,445	19

Old Growth

In this alternative, Unit 81 would not be treated. The condition for Stands 42201139, 42201147, and 42201152 would remain as described above for the current condition and alternative 1.

Unit 2 would be treated the same under alternative 3 as alternative 2 and the effects would be the same as described above.

The treatment area for Unit 46 would remain the same, but treatments for most of Unit 46 would change. Unit 46 in alternative 3 is split into Unit 46a and 46b. Unit 46b (27 Acres) would have the same treatment as described above for alternative 2 Unit 46 with the same treatment effects. In Unit 46a, which includes 93 acres of Stand 42303130, the treatment would be modified and is referred to in the Stonewall Vegetation Project as “prescription Group 10.”

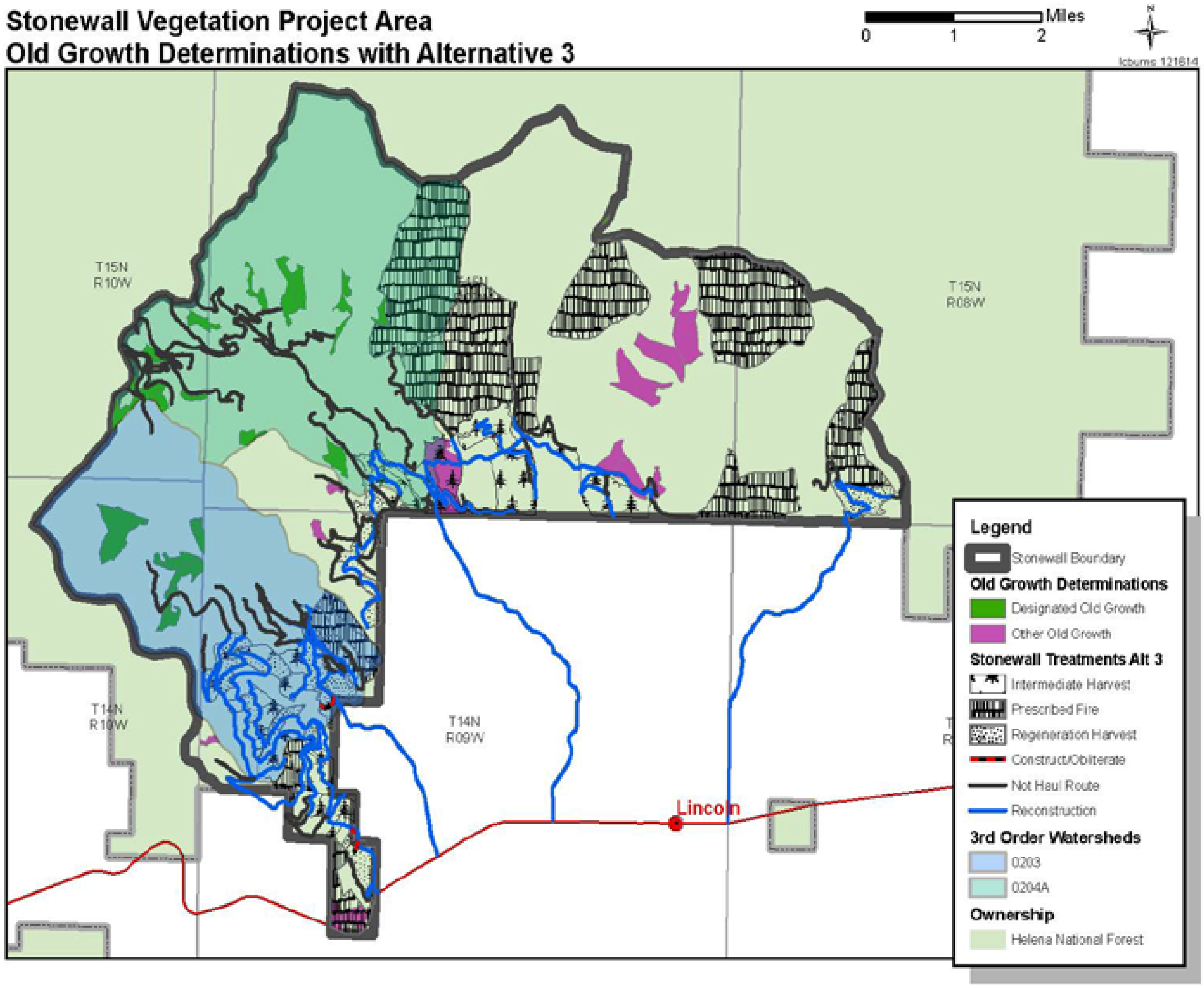


Figure 64. Alternative 3 Units and old-growth stands

Group 10. This group includes Units 46a and 47a. Treatments would be designed in a mosaic pattern to maintain cover and forage for wildlife while promoting ponderosa pine and aspen, and reducing ladder fuels. Portions of the stands would be thinned to: (1) reduce understory competition from around large ponderosa pine trees; (2) thin heavily-stocked groups of trees on sites historically dominated by ponderosa pine, and (3) remove conifer competition from within and around quaking aspen.

- To reduce understory competition around large ponderosa pine, and move areas toward or maintain multi-storied ponderosa pine structure, within 50 feet of ponderosa pine trees larger than 17 inches d.b.h. remove all but two trees. The retained trees should be of varied size and age classes.
- In areas dominated by ponderosa pine, but lacking live trees greater than 17 inches d.b.h., trees would be thinned to 48 to 109 trees per acre depending upon tree size.
- Ponderosa pine snags greater than 17 inches d.b.h. would be favored for retention to meet Forest Plan direction for snags.

- Conifers less than 17 inches d.b.h. would be removed up to 100 feet of existing aspen patches.
- Post-thinning, slash would be jackpot burned or hand-piled and burned to reduce fuels.
- Treatments would affect up to 50 percent of these units.

For Stand 42303130 in Unit 46a, up to one-half of the area (47 acres) would be thinned and the fuels reduced, the other one-half of the stand would not be treated. Note that this is the stand area not the unit area because the unit is composed of more than one stand. The post-treatment diameter distribution would be similar to that shown in figure 65 and figure 66. The scale for figure 65 is the same as shown above for the current condition (figure 56).

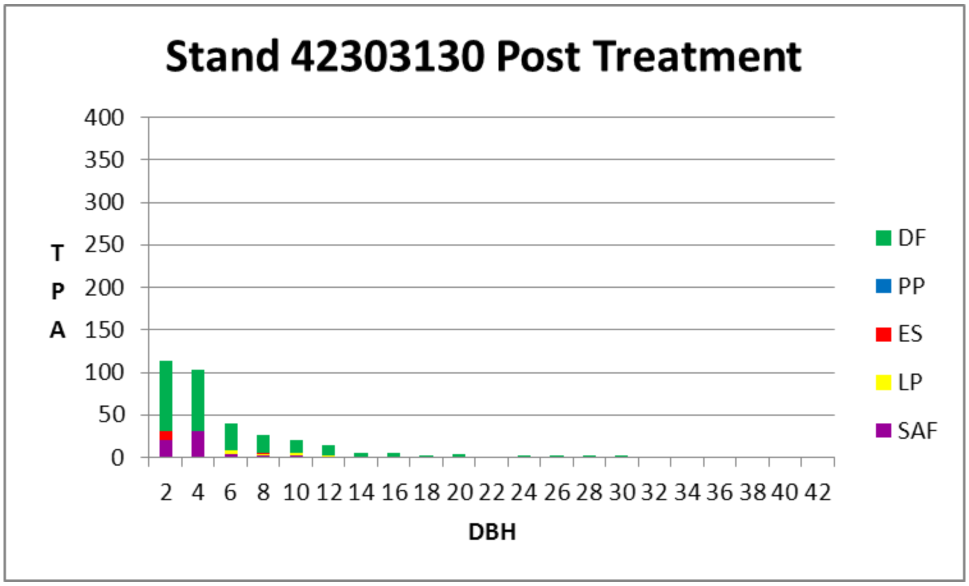


Figure 65. Stand 42303130 (Unit 46) post-treatment in alternative 3

The scale for figure 66 has been changed to better display the larger trees. The post-treatment stand would have 974 TPA with about 13 TPA greater than 17 inches d.b.h. In figure 65 and figure 66, about 632 TPA less than one inch in d.b.h. are not displayed. Post-treatment, the stand would still qualify as old growth.

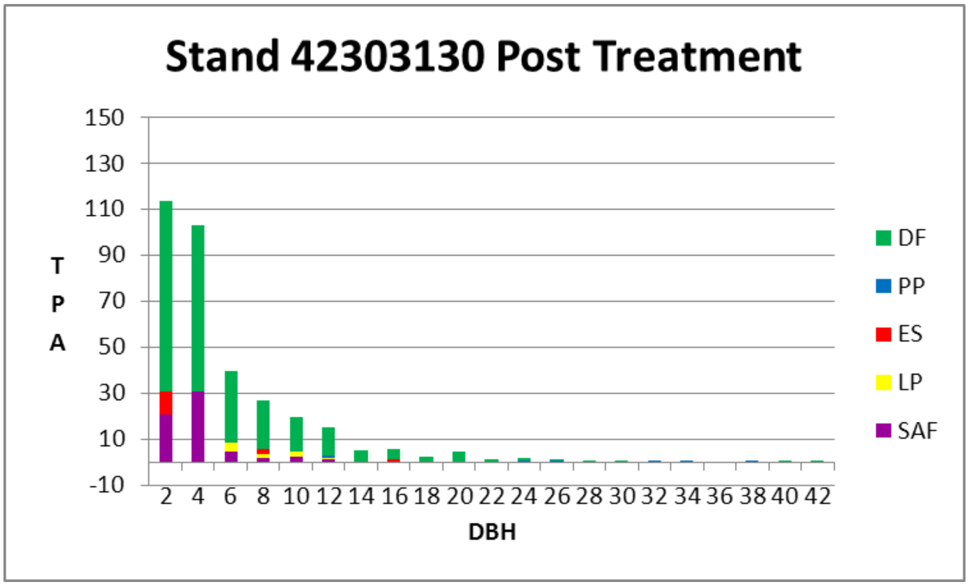


Figure 66. Stand 42303130 (Unit 46) post-treatment in alternative 3

Cumulative Effects

Snags

The hazard reduction treatment would remove snags from about 1 percent of 3rd-order drainage 0203, 2 percent of drainage 0204A, and approximately 2 percent of the project area. Considering the numbers of snags available accross the project area as a result of the mountain pine beetle epidemic, the hazard reduction represents a small amount of snag removal. As described above, under alternative 3, snag levels would still be available at 21 to 24 times the Forest Plan minimum requirements. Cumulative effects would still be that level.

Old Growth

As discussed above, activities other than the Stonewall Vegetation Project that are or may occur within the project area would have no impact on old growth forests. Cumulative effects of this alternative would be as described above for the direct and indirect impacts.

Summary and Forest Plan Consistency

Snags

Under alternative 3, the intermediate and regeneration treatments would reduce snag levels to the forest plan requirements and the prescribed burns would increase snag levels. After the treatments are done, snag levels would slightly decrease in the 3rd-order drainage 0203, slightly increase in the 3rd-order drainage 0204A, and slightly increase in the project area. They would still exceed 20 times the forest plan requirements.

Old Growth

As discussed and displayed previously, no designated old growth in 3rd-order drainages would be treated under this project. Forest Plan direction regarding old growth would be met. Outside of the 3rd-order drainages, one stand of old growth (41502089) would be prescribe burned, and one stand of old growth (42303103) would be partially thinned and the fuels burned.

Both stands proposed for treatment would be changed by the treatments, with species compositions “pushed” toward dominance by seral fire-tolerant conifers, and stand structures “pushed” toward open, but still multi-story, structures with flatter than current diameter distributions. They would still qualify as old growth following the treatment.

Wildlife

Introduction

This section analyzes impacts to wildlife and wildlife habitat from federal activities proposed in the Stonewall Vegetation Project (SVP) Environmental Impact Statement (EIS). It considers regulatory direction related to the wildlife resource, describes the current wildlife habitat conditions that exist within the Stonewall Vegetation Project area, and evaluates effects to federally proposed, threatened and endangered and regionally sensitive (sensitive) species, Helena National Forest (HNF) management indicator species (MIS) and migratory birds. Because wildlife distribution and use is determined by both site-specific and landscape-level conditions, a multi-scale analysis is presented that looks at specific stands proposed for treatment (fine filter analysis), as well as landscape considerations (coarse filter analysis) such as the availability of habitat within and adjacent to the project area. More information on federally listed threatened and endangered (TE) species can also be found in the Stonewall Vegetation Project Biological Assessment (BA)(Reitz 2013).

Regulatory Framework

The principle laws and management direction relevant to wildlife for this project include the; National Forest Management Act of 1976 (NFMA), the Endangered Species Act (ESA) of 1973, the Migratory Bird Treaty Act (MBTA) of 1918 (as amended), the Forest Service Manual (FSM 2600), Montana’s Comprehensive Fish and Wildlife Strategy (2005), and the Helena National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service 1986).

More information regarding this management direction is available in chapter 1. Forest Plan goals and objectives related specifically to wildlife are available in the Stonewall Vegetation Project Biological Assessment (Reitz 2013), which is available in the project record.

Method of Analysis

Analysis Process

National Forest Management Act (NFMA) regulations (1976) require that habitat be managed to support viable populations of native and desired nonnative vertebrates within the planning area (36 CFR 219.19). USDA regulation 9500-004, adopted in 1983, reinforces the NFMA viability regulation by requiring that habitats on national forests be managed to support viable populations of native and desired nonnative plants, fish, and wildlife. The following five-step process used in this analysis assesses changes in wildlife habitat and determines possible effects to viability:

Step 1: Pre-field Assessment - Once the initial proposed action was developed, information was collected to identify the wildlife present condition or affected environment. This information included aerial photos, GIS data, past timber sale activity, existing wildlife surveys, Forest and District monitoring data, and vegetation data and information on insect and disease related mortality.

Step 2: Field Assessment - Sites proposed for treatment were visited by a biologist(s). During this review, observations and incidental sign of wildlife were recorded, and habitat conditions identified in the pre-field assessment were validated.

Step 3: Wildlife Screening - Collectively information from the pre-field and field assessments were used to identify project design features (pdfs) or modifications to the proposed action that may be necessary to reduce or eliminate impacts to wildlife. This information was then used in combination with scientific literature, Forestwide and Regionwide assessments and monitoring and species conservation assessments to identify species and habitats most likely to be affected by the proposed activities, and identify the appropriate level of analysis necessary to determine effects to wildlife. Based on information provided in steps 1 and 2, a total of 18 threatened, endangered and sensitive species found on the HNF, 4 MIS species and 2 commonly hunted species were evaluated. Eight species either do not have suitable habitat within the project area, or the project area falls outside the current range (table 64). As a result, of the species considered, 16 species are evaluated in detail in this analysis.

Step 4: Habitat & Species Assessment - The analysis of the wildlife resource was done using a multi-scale assessment that includes a combination of three basic strategies.

1. The first strategy is a coarse filter approach (described below), which is used to identify wildlife communities across the landscape. This approach assumes that if the species, genetics, functions and processes are protected at the community level, then the bulk of the biotic species, both known and unknown, would also be protected.
2. The second strategy is the MIS approach (FSM 2620), which assesses effects to wildlife species associated with vegetation communities or key habitat components identified in the Forest Plan (USDA Forest Service 1986) as management indicators. Potential effects of proposed actions are then evaluated by assessing habitat changes to the selected indicator species
3. The third strategy is to assess habitat and effects to those species considered most at risk or those species with potential viability concerns. These include Federally Threatened and Endangered Species and Regionally Sensitive species (FSM 2670.32, 16 USC 1536).

Using information from steps 1-3, anticipated changes in wildlife habitat and the associated communities are predicted under the alternatives considered and associated effects to wildlife and wildlife habitat evaluated. Information from steps 1 and 2 are also used to complete the course filter analysis, identify and evaluate spatial relationships between habitat(s), assess changes in landscape diversity and predict changes and effects to MIS species. Whereas site-specific data is used to assess stand-level changes in habitat and to ensure that unique vegetative and physical habitat conditions are maintained and/or protected. This information is also used to assess changes in population viability in step 5.

Step 5: Population Viability Assessment and Determination - Using information from Steps 1-4, the population viability for all MIS and Threatened, Endangered and Sensitive (TES) species evaluated in detail is assessed under each of the alternatives. Region 1 (R1) uses a principle-based approach to population viability analysis (PVA), which follows Regional guidance (USDA Forest Service 1999). This assessment is based on the best available forest and rangeland vegetation data, the most current scientific information related to species requirements and effects of proposed actions, and when available, Regionwide and Forestwide conservation assessments. Collectively this information is used to assess the availability of suitable habitat and ultimately assess short- and long-term viability to each species.

Collectively, the strategies and assessment described above are used to ensure that National Forest Management Act (NFMA) requirements are met by ensuring that a diversity of plant and animal communities are maintained across the planning area (16 U.S.C. 1604(g)(3)(B); also see 36 CFR 219.10(b); and FSM 2670.12). The information identified in steps 1 through 4 in combination with applicable scientific information (referenced literature) and professional judgment are used to predict anticipated effects, as well as determine the scope of effects.

For sensitive species, a determination is made as to whether or not the federal action would cause a trend toward federal listing or a loss of viability. Listing factors are based on 50 CFR 424.11 including; the present or threatened destruction, modification, or curtailment of the species' habitat or range, overutilization for commercial, recreational, scientific, or educational purposes, disease or predation, the adequacy of existing regulatory direction or other natural or manmade factors affecting the species' survival. A loss of viability is determined though the regional process identified above and would occur if anticipated effects included changes in the number or distribution of reproductive individuals that would affect the continued existence of the species on the Forest (36 CFR 219.9).

Methodologies used to assess individual species are summarized under the individual species sections. More detailed information related to the habitat relationship models used can be found in the project file.

Scale of Analysis

The appropriate methodology and level of analysis needed to determine effects are influenced by a number of variables including the presence of species or habitat, the scope and nature of activities associated with the proposed action and alternatives and the potential risks that could ultimately result in adverse effects. Wildlife distribution and use of an area is largely determined by the availability of suitable habitat, and can be influenced by site-specific needs such as the vegetative structure or physical features on a site, as well as by landscape considerations such as the proximity to other habitat or the need for isolation or seclusion. As a result, a multi-scale analysis that looks at site-specific conditions in stands proposed for treatment (fine filter); as well as landscape considerations such as the proximity and availability to other habitat (coarse filter) are considered. The multi-scale of analyses used in this assessment includes the following:

Site Level Assessment – This level of assessment involves evaluation of individual stands or sites proposed for treatment. Wildlife use is often influenced by specific conditions only identified at the stand or site scale, and can vary from one to several hundred acres. This level of analysis identifies stand-level habitat conditions that influence wildlife use. It is also used to identify habitat features that may need protection or enhancement, and effects based on localized stand structure. Finally, this level of assessment is used to identify site-specific mitigation measures or project design features (pdfs).

Project Area Assessment – Unless otherwise noted in the species-specific section, direct and indirect effects to wildlife are assessed by evaluating effects and changes in habitat on National Forest System lands within the project area boundary. The Stonewall project area encompasses approximately 24,000 acres including 23,668 acres of NFS land and 337 acres of private land. The project area boundary was selected for analysis of direct and indirect effects on wildlife because it includes all areas proposed for treatment and contains an adequate diversity of habitat conditions (vegetative and topographic) to assess wildlife distribution and use.

Cumulative Effects Assessment – Cumulative effects (CE) related to wildlife are evaluated by looking at past, present and foreseeable future activities that could adversely affect wildlife when considered cumulatively over time. A complete list of activities considered in this analysis for cumulative effects can be found in volume 2, appendix C of this document.

The cumulative effects boundary used in this analysis varies by species. For example, cumulative effects for species with small home ranges would be analyzed across the project area. For species that have large home ranges and select habitat based partially on landscape conditions, the cumulative effects analysis area includes the project area combined with adjacent lands affected by mountain pine beetle (MPB) mortality and wildfire. This combined area totals approximately 101,977 acres, including 67,042 acres of NFS land, and 34,935 acres of private land. Rationale for selection of this area includes:

- This area is large enough to assess the individual home range for all species with large home ranges that select habitat based in part on landscape conditions.
- The cumulative effects area includes more developed private lands adjacent to the project area, which contain habitat components or levels of disturbance that may influence wildlife use of NFS lands
- This area includes all of the two Elk Herd Units (EHU) and Lynx Analysis Units (LAU) affected.
- This area is large enough to assess landscape-level considerations and connectivity, including potential impacts to affected Bear Management Units (BMUs), EHUs and LAUs.
- Including lands to the north and northwest would tend to dilute effects because of the large amounts of designated Wilderness and Inventoried Roadless Areas.
- The cumulative effects area includes over 20,000 acres that have been recently (since 2003) affected by wildfire, which influence landscape-level use and effects.

A determination of significance is made for each species/habitat evaluated. For the purpose of this analysis, significant cumulative effects are defined as effects that singly or incrementally could result in long-term impacts to wildlife or wildlife habitat that could result in a loss or reduction in viability (defined above). Activities used to evaluate cumulative effects are displayed in volume 2, appendix C.

Timeframes

Timeframes for direct and indirect effects include short-term effects, which generally go out 10 years or until the proposed activities are completed, and long-term effects, which are greater than 10 years and may go out several decades. Past activities are summarized in appendix C; ongoing and future activities go out to year 2022, which is when all of the proposed treatments are expected to be completed, and when future projects can be reasonably predicted.

Assumptions

A number of factors have recently affected wildlife habitat in the project area, and are also likely to change habitat conditions in the future. Additionally, because many wildlife species utilize a wide range of habitat conditions, this analysis is based on representative habitats identified in available scientific literature. Much of the information comes from field examination of the project are. Where direct observation of local habitat components or wildlife species was not possible, inferences were made from scientific research and ecological theory to fill in data gaps and to provide a broader context for interpreting local wildlife patterns. The analysis presented confines itself to aspects of the environment that are of particularly significance to wildlife. It is by no means an exhaustive review of all the available habitat components. The wildlife species associated with different habitats come from personal observations, observations reported by other biologists and personnel, landbird surveys and studies summarized in the References section.

The following are some of the assumptions related to habitat relationships and factors that are expected to influence future habitat conditions:

Limitations of Wildlife Models

Habitat models are designed to relate the occurrence or abundance of a species to environmental predictors, which can then be used to allow these predictions to be mapped within a particular landscape or region (Barry and Elith 2006). These predictions have inherent limitations and it is important to understand these limitations to allow for transparency in decision making.

Habitat model limitations stem from two general types of errors: deficiencies in data and deficiencies in their ecological realism. Data deficiencies arise from small sample sizes, lack of absence data, and missing predictor variables that may be useful in explaining environmental constraints. Model deficiencies also arise from small sample sizes that are usually not randomly derived. Further, it is difficult to model species' distribution due to the variety of biotic and abiotic factors that comprise species' ecological requirements. Species' responses to environment "depend on the competitive context, and this in turn varies given the dynamic nature of species' distributions, the effects of natural and human disturbance, and the complicating effects of variation in the speed with which different species reoccupy sites from which they have been displaced".

Models are a simplification of complex biological systems and therefore cannot be perfectly predictive. Most habitat models are limited to vegetative structure and do not include other habitat variables (e.g., microclimate) and other life history phases (e.g., dispersal, territory establishment). General models tend to be simpler, which in turn enhances the clarity of the model and increases its applicability over a broader range (Van Horne 2002 p.64).

Habitat models that rely on point of detection (POD) data have been successfully utilized to predict habitat relationships and build species' models. Sergio and Newton (2003, p. 857) describe how (1) "…occupancy (POD) may be a reliable method of (habitat) quality assessment, especially for populations in which not all territories are occupied, or for species in which checking occupancy is easier than finding nests," (2) "…successful conservation should maintain or improve high quality (occupied) sites rather than focusing on poor (unoccupied) sites" (p. 863), (3) occupancy data are often available, either by specific or amateur monitoring schemes, and (4) occupancy through space and time is a reliable measure of territory quality, and thus can provide key information for the development of conservation strategies.

Habitat models described in Samson (2005) are based on peer-reviewed literature, non-peer reviewed publications, particularly unpublished master's theses and PhD dissertations, research reports, and data accumulated by the Forest Service. Where possible, the peer-reviewed professional society literature is emphasized in that it is the accepted standard in science. The models described in Samson (2005, 2006) and summarized in Criteria for Wildlife Models Helena National Forest Version June 2009 (USDA 2009a) are based on research findings and POD data collected in Region One.

Habitat Relationships and Biophysical Settings

The analysis of habitats presented here emphasizes vegetation and structural conditions important to wildlife; additional information on biophysical settings evaluated can be found in the SVP Silviculture Specialist Report (Amell and Klug 2015), the SVP Fire and Fuels Specialist Report (Buhl 2015) and the Montana Partner In Flight (PIF) physiographic plan (PIF 2000).

Many species such as pileated woodpeckers, American marten, and northern goshawk, are strongly tied to individual vegetative types, size classes, stand structural characteristics, landscape-scale patterns or topographic features, or combinations of the above. For instance, pileated woodpeckers nest predominantly in large-diameter ponderosa pine or cottonwood snags (McClelland 1977); American marten occur within dense, mid- to late- seral spruce/fir/lodgepole pine forests (Ruggiero et al. 1994); and goshawks nest within multi-storied, mid- to late-seral forests at all but the highest elevations (Reynolds et al. 2006). Although these habitat associations are well researched and accepted in the scientific community, "outliers" or rare occurrences of individuals using uncommon habitats do occur and are acknowledged in the literature. For instance, research shows that goshawks have a preference for stands no less than 30 acres in size (Reynolds et al. 2006), yet McGrath et al. (2003), sampled nest stands that were much smaller. McClelland (1977) found that pileated woodpeckers almost exclusively nest in ponderosa pine, cottonwood, and western larch (west of the divide), but reported a rare use of Douglas-fir snags. Researchers typically acknowledge but disregard outlying results when identifying habitat associations. Consequently the analysis presented assumes that species sustainability is best modeled by using what the scientific literature designates as typical habitat for a species and does not consider atypical outliers unless data collected in the project area supports use of ‘atypical’ habitat relationships.

Geographical Information System Data

Geographical Information System (GIS) and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Further, results may vary amongst products and outputs. Therefore, calculations (acres and miles) are usually expressed as ‘approximate’ to account for this variation. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results.

Rate of Mountain Pine Beetle Mortality

In western disturbance-prone forests, the distribution of habitats is strongly influenced by the severity and frequency of natural disturbances. While these disturbances are inevitable, it is usually difficult to predict when, where, and to what extent they would occur. Because of this uncertainty, disturbances are disclosed as “risks.” The mountain pine beetle (MPB) outbreak in the Stonewall Project area, however, has approached a point of relative certainty and MPB outbreaks are at epidemic levels. Annual insect and disease detection surveys show greatly increased levels of MPB mortality (Amell and Klug 2015). Vegetation data based on R1-VMAP across the project area are categorized as pre-kill data (what R1-VMAP identified as being present in 2005) and post-kill data (current conditions). Mountain pine beetle mortality has increased and is expected to continue into the future, thus, post-kill conditions best describe the existing condition for most species and establish the baseline against which the effects of different alternatives are compared for wildlife. The pre-kill data, however, provides important context for the vegetative changes that have transpired in the last few years, and may be used to display changes in habitat for some species. The data used is discussed under the methodology sections for each species.

Rate of Snag Attrition Following Mortality

The Stonewall Project area is expected to have a high density of ponderosa pine snags due to anticipated mortality. The Regional Snag Protocol (USDA Forest Service 2000) describes large, old ponderosa pine snags as being highly durable in that they can stand for decades after death. Smith (2000) and Perrakis and Agee (2006) attribute this durability to age, slow growth, and repeated exposure to nonlethal fire scarring that induces damaged trees to exude pitch, which inhibits rot. In contrast, according to Smith (2000), the high density of 80- to100-year-old ponderosa pine snags that result from the current MPB infestation would fall within the decade. This is due to a lack of factors that make these snags durable. The trees are young (80–100 years), grew rapidly, have a high ratio of sapwood, and were not exposed to nonlethal fire-scarring. Observations in the project area and other comparable areas reaffirm Smith’s (2000) findings. Snags typically fall 3–4 years after death. Most appear to have rotted off at ground level. While a few snags may stand longer than 3–4 years, it is expected that virtually all would be on the ground within 10–20 years. Consequently, the availability of snags, including large-diameter ponderosa pine snags preferred by the pileated woodpecker (Bull 1987; McClelland 1977) and flammulated owl Hayward and Verner 1994; Wright 2000) is expected to be reduced under all alternatives.

Probability of Severe Wildfires following Mountain Pine Beetle Mortality

Wildfires are inevitable (Arno 2000; Arno et al. 1995; Arno et al. 1997). They are essential for many wildlife species, beneficial to some, and detrimental to others, depending upon the magnitude and severity of the fires. Higher-than-normal severity wildfires that cover larger-than-normal expanses can be detrimental to wildlife (Turner et al. 1994), especially when they occur on landscapes that historically had low or moderate severity wildfires. Wildfire severity is typically modeled using NEXUS, FlamMap, or other models (Buhl 2015) and is usually based on such factors as stand density and structural complexity (ladder fuels) (Finney 2006). Models are commonly used to address the long-term sustainability of wildlife habitats. In most cases, changes in wildfire severity are considered an indirect effect upon wildlife. Effects are further qualified as to the degree that wildlife habitats can be sustained into the future based on the risks and severity of predicted fires.

Risk of Invasive Weeds on Disturbed Sites

Grasses and forb***s*** underlying open, dry ponderosa pine/Douglas-fir stands provide valuable habitat and forage for wildlife. Invasive weeds such as leafy spurge, spotted knapweed, and Dalmatian toadflax, which are well-adapted to occupy dry sites, can out-compete native grasses and forbs and dramatically reduce the habitat quality (Ortega et al. 2006). Actions that reduce the forest canopy and disturb the soil can make sites vulnerable to invasive weeds. Equipment used to thin forest canopies and roads used for vehicle access further increase the vulnerability of droughty sites to weeds by creating vectors for weed introduction. While measures to avoid invasive weeds can be effective (DiTomaso 2000), it is assumed that future monitoring and treatment would be implemented under all alternatives to help contain or control invasive plants.

Climate Change

Climate change has occurred to some degree and will continue in the future. Ramifications of a changing climate on wildlife are likely to include; reduced snowfall or earlier snow melt in the spring, extended periods of drought or extended dry periods in the spring and summer, more frequent and larger wildfires, increased bark beetle mortality and changes in site characteristics that promote climax vegetation or community changes (USDA Forest Service 2007f).

These changes cause seasonal ranges and food sources for wildlife to shift and can affect the timing of reproduction. Reduced snowpack and changes in precipitation can affect amphibians by reducing water levels in lakes and ponds, as well as affect species such as Canada lynx, marten and wolverine that rely on deep or persistent snow. Forested tracts and remote habitats can also become isolated, reducing landscape connectivity and habitat for species such as wolverine (USDI Fish and Wildlife Service 2013). The timing of spring green up can also affect food availability for migratory birds or forage conditions for big game (United States Geological Survey 2008, USDA Forest Service 2007f, Wolverine Network 2012, USDI Fish and Wildlife Service 2012, USDI Fish and Wildlife Service 2013).

Climate change presents an aspect of uncertainty in future conditions, disturbance regimes, and vegetative and wildlife responses. Strategies that can be used to help reduce impacts include; managing for diverse conditions, maintain healthy and connected populations, reduce the risk of catastrophic fire, prevent and control invasive species, and ensure ecosystem processes and habitat connectivity (Mawdsley et al. 2008). While how well each of the alternatives addresses these strategies varies, it is assumed that to a certain extent, climate change and associated effects to wildlife would occur under all alternatives.

R1-VMAP and Forest Inventory Analysis (FIA) Intensified Grid Data

R1-VMAP data are remotely sensed while FIA (intensified grid data) are from on-the-ground plots. These two datasets are used to describe the habitats in this analysis. R1-VMAP represents a broad-scale, coarse filter depiction. It relies on satellite imagery and describes three main vegetation components—canopy cover, tree dominance type, and stand size. R1-VMAP spatially represents habitats at the landscape level and within the project area. It also provides a context against which to identify treatment effects on a given habitat. The intensified grid data are point data and generally incorporate additional vegetation parameters not included in R1-VMAP. For example, snag and down wood habitat data are collected as part of intensified grid point data and cannot be derived from R1-VMAP. Point data also provide an opportunity to refine and verify broad scale spatial data (i.e., R1-VMAP) and also provide a baseline against which future management actions may be measured.

Proposed Action and Alternatives

Proposed Action – Alternative 2

Fire suppression and moist growing conditions through much of this century resulted in a loss of open forest conditions and seral species (aspen, ponderosa pine and western larch). This has created a more uniform landscape comprised of dense forests susceptible to insect and wildfire mortality (Douglas-fir and lodgepole pine), than occurred historically. In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and many mature ponderosa pine within the analysis area. These conditions are elevating fuel levels which pose a wildfire threat to nearby homes and communities in the wildland urban interface (WUI). Additionally, due to decades of fire suppression, fire dependent species and species dependent on disturbance such as whitebark pine, ponderosa pine and aspen are declining within the project area.

In order to address these conditions, as well as concerns associated with increased risk of stand-replacing wildfire and a loss of fire-resistant species, the Helena National Forest (HNF) is proposing the Stonewall Vegetation Project. This project was developed following a watershed analysis for the Stonewall project area and includes three separate areas including two areas that were brought forward to the Forest by the Lincoln Working Group (LWG) of the Montana Forest Restoration Committee (MFRC), and a third area that was a product of watershed analysis. The recommended actions associated with the three areas are consistent with the Forest Plan for the Helena National Forest and the purpose and need for the project, and include:

- Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects.
- Modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape.
- Enhance and restore aspen, western larch, and ponderosa pine species and wildlife habitat conditions.
- Utilize economic value of trees with economic removal.
- Integrate restoration with socioeconomic considerations.

The proposed action includes a mix of treatments that are designed to achieve the purpose and need. These treatments, which include commercial and noncommercial timber harvest, reforestation activities (e.g., planting), prescribed burning, fuels treatments and transportation activities are summarized in table 61. Harvest and burning treatments are also listed by Group, which is based on site conditions, objectives and type of treatment.

Table 61. Proposed action treatment summary

Treatment Group	Activity[2]	Amount Ac	Amount %[1]	Treatment	Objective
Timber Harvest and Burning					
Group 1		974	4.1		
	Improvement Cut	**974**	**4.1**	Units contain dense mature forest conditions with high mountain pine beetle mortality. Thin, remove dead trees and prescribe burn surface fuels.	Restore open Douglas-fire and ponderosa pine stands that are resilient to wildfires and insect activity. Promote ponderosa pine, Douglas-fir and large diameter trees.
	Jackpot Burn	36	0.2		
	Underburn	938	3.9		
Group 2		1,132	4.7		
	Pre-commercial Thin	**1,132**	**4.7**	Pre-commercial thin dense young forests, remove dead trees and burn surface fuels.	Reduce stand density, maintain stand health and growth. Promote development of mature open stands of Douglas-fir, ponderosa pine and western larch. Maintain/improve aspen component.
	Hand Pile and Burn	77	0.3		
	Underburn	289	1.0		
	Underburn or Slash	242	1.0		
Group 3		745	3.1		
	Seedtree Cut	**343**	**1.4**	Regenerate mixed ponderosa pine/lodgepole pine stands with concentrated mountain pine beetle mortality. Harvest or slash undesirable or insect infested trees, prescribed burn. Naturally regenerate with supplemental planting of desirable species.	Restore mixed species stands dominated by fire resistant seral species. Promote development of open stand with small groups of Douglas-fir, ponderosa pine, Engelmann spruce, subalpine fir. Maintain/improve aspen component.
	Shelterwood Cut	**402**	**1.7**		
	Broadcast Burn	29	0.1		
	Hand Pile and Burn	43	0.2		
	Jackpot Burn	210	0.9		
	Underburn	337	1.4		
	Site Prep Burn	126	0.5		
Group 4		223	0.9		
	Clearcut	**223**	**0.9**	Regenerate dense lodgepole pine stands with concentrated mountain pine beetle mortality. Natural regeneration of lodgepole with underplanting of desirable species.	Restore insect-damaged stands and improve stand diversity. Reduce fuels and increase resilience to wildfire and insects by increasing Douglas-fire, ponderosa pine and western larch component.
	Broadcast Burn	98	0.4		
	Jackpot Burn	53	0.2		
	Site Prep Burn	54	0.2		
	Underburn	19	0.1		
Group 5		25	0.1		
	Sanitation Cut	**25**	**0.1**	Salvage dead and dying lodgepole from mixed stands with scattered mountain pine beetle mortality.	Maintain current stand conditions while reducing ladder and surface fuels.
	Hand Pile and Burn	25	0.1		

Treatment Group	Activity[2]	Amount		Treatment	Objective
		Ac	%[1]		
Group 6		449	1.9		
	Prescribed Burn and Slash Treatment in Inventoried Roadless Area	449	1.9	Burn mixed forest dominated by ponderosa pine, Douglas-fir and dead lodgepole pine using low severity fire to reduce fuels. Some small trees would be cut to reduce fire severity.	Reduce fuels and promote understory development of fire resistant species. Improve stand structure, including open stand conditions, with 5-10 acre openings. Enhance aspen.
Group 7		410	1.7		
	Prescribed Burn and Slash Treatment in Inventoried Roadless Area	410	1.7	Burn mixed forest dominated by ponderosa pine, Douglas-fir, aspen, white-barked pine and dead lodgepole pine using mixed severity fire. Cut small trees in some areas to reduce fire severity.	Reduce fuels and promote understory development of fire resistant species. Improve stand structure, age class diversity including open stand conditions, with 5-20 acre openings. Enhance aspen and white-bark pine. Reduce risk of catastrophic wildfire and restore historic mixed severity regime
Group 8		4,604	19.2		
	Prescribed Burn and Slash Treatment in Inventoried Roadless Area	4,604	19.2	Burn mixed forest dominated by ponderosa pine, Douglas-fir and some pure lodgepole sites using mixed severity fire. Pockets of concentrated beetle mortality, ponderosa pine at lower elevations and white-barked pine at higher elevations. Scattered grasslands and meadows. Some small trees would be cut to reduce fire severity.	Reduce fuels and promote understory development of fire resistant species. Improve stand structure, age class diversity and open stand conditions, with openings of 30 to 75 acres. Enhance aspen and white-bark pine. Reduce risk of catastrophic wildfire and restore historic mixed severity regime
Harvest and Burning Totals					
Total Treatment		8,564	36		
Total Harvest		3,099	13		
Intermediate Harvest		2,132	9		
Regeneration Harvest		968	4		
Total Burning		8,039	33		
Burn Only (No Harvest)		5,463	23		
Transportation					
Road Maintenance		45.6 miles			
Construction of roads to be used and then obliterated after timber removal		2.6 miles			
Haul Roads		48.2 miles			

Additional Alternatives Considered

Two alternatives to the proposed action were considered including alternative 1-no action, which if implemented current management of the project area would continue, and alternative 3, designed to reduce impacts to wildlife. Alternative 2 is the proposed action described above, whereas alternative 3 was developed based on the issues identified through scoping. The following is a description of each of the additional alternatives considered for the Stonewall Vegetation Project.

Alternative 1 - No Action

The proposed vegetation treatments, reforestation activities, and burning and transportation activities would not be completed under this alternative. While routine custodial or maintenance activities would occur, and 382 acres of pre-approved hazard tree removal would be implemented, there would be no new Forest activities proposed. Alternative 1 would let ecological processes control vegetation development and habitat changes would occur primarily from natural disturbances. This alternative provides a baseline or reference point, from which effects of the action alternatives can be evaluated.

Alternative 3 - Reduced Impacts to Wildlife

A number of public issues were identified during scoping including:

- The proposed action may impact habitat for threatened, endangered and sensitive species and designated critical habitat.
- Management Indicator Species (MIS) may be adversely affected by the proposed action.
- Big game hiding, thermal and security cover and habitat may be reduced.
- Habitat connectivity and the viability of old growth and snag dependent species may be reduced.

Alternative 3 was developed to address these issues by 1) reducing pre-commercial thinning, intermediate and regeneration harvest activities, 2) reducing mixed severity wildfire that would result in larger pockets of mortality (i.e., greater than 20 acres), 3) increasing jackpot burning to reduce fuels, and 4) increasing low-severity burning that would result in smaller pockets of mortality (i.e., less than 5 acres). Table 62 compares proposed activities for alternatives 2 and 3.

Table 62. Proposed treatment activities comparison of alternatives 2 and 3

Group Number: Brief Treatment Description Harvest Treatment, Fuels Treatment	Alternative 1 No Action	Alternative 2 Acres	Alternative 3 Acres
Group 1: Intermediate Harvest to Promote Mature Open Forests	0	**974**	**232**
Improvement Cut, Jackpot Burn	0	36	0
Improvement Cut, Underburn	0	938	232
Group 2: Intermediate Harvest to Thin Young Forests	0	**1,132**	**822**
Pre-commercial Thin	0	523	409
Pre-commercial Thin, Handpile Underburn	0	0	29
Pre-commercial Thin, Handpiling, Burn Piles	0	78	50
Pre-commercial Thin, Underburn	0	289	141
Pre-commercial Thin, Underburn or Slash Treatment along PVT	0	242	193
Group 3: Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees	0	**745**	**664**

Group Number: Brief Treatment Description Harvest Treatment, Fuels Treatment	Alternative 1 No Action	Alternative 2 Acres	Alternative 3 Acres
Seedtree with Reserves, Broadcast Burn	0	29	29
Seedtree with Reserves, Jackpot Burn	0	73	41
Seedtree with Reserves, Slashing, Handpiling, Burn Piles	0	18	18
Seedtree with Reserves, Underburn	0	223	207
Shelterwood (Group) with Reserves, Jackpot Burn	0	137	137
Shelterwood (Group) with Reserves, Site Prep Burn	0	96	96
Shelterwood (Group) with Reserves, Slashing, Handpile/Burn	0	25	0
Shelterwood (Group) with Reserves, Underburn	0	114	114
Shelterwood with Reserves, Site Prep Burn	0	30	22
Group 4: Regeneration Harvest in Areas of High Mortality Retaining Rare Live Trees	0	**223**	**152**
Clearcut with Reserves, Broadcast Burn	0	98	80
Clearcut with Reserves, Jackpot Burn	0	53	0
Clearcut with Reserves, Site Prep Burn	0	54	54
Clearcut with Reserves, Underburn	0	18	18
Group 5: Intermediate Harvest to Remove Minor Amounts of Dead/Dying Trees	0	**25**	**25**
Sanitation, Slashing, Handpiling, Burn Piles	0	25	25
Total Harvest Treatment (acres)		*3,099*	*1,895*
Group 6: Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 acres	0	**449**	**326**
Low Severity Fire, Openings <5 acres	0	326	326
Low Severity Fire, Openings <10 acres	0	123	0
Group 7: Mixed Severity Fire to create mortality patches up to 5, 10, or 20 acres	0	**410**	**36**
Mixed Severity Fire, Openings <5 acres	0	36	36
Mixed Severity Fire, Openings <10 acres	0	48	0
Mixed Severity Fire, Openings <20 acres	0	326	0
Group 8: Mixed severity fire to create mortality patches up to 30 or 75 acres	0	**4,604**	**3,265**
Mixed Severity Fire, Openings <30 acres	0	3,371	2,032
Mixed Severity Fire, Openings <75 acres	0	1,233	1,233
Group 9: Low Severity Prescribed Fire	**0**	**0**	**638**
Jackpot Burn	0	0	326
Underburn	0	0	311
Group 10: Intermediate Harvest to Promote Mature Open Forests	0	0	**403**
Improvement Cut, Jackpot Burn	0	0	403
Grand Total Treatments (acres)	**0**	**8,564**	**6,564**
Roads			
Roads Constructed for project use then obliterated (miles)	--	2.6	0.4
Road Maintenance (miles)	--	45.6	43.8
Total road miles used	**--**	**48.2**	**44.2**

Habitat and Species Evaluated

Species considered in this analysis include species listed as federally threatened, endangered, proposed or candidate on the HNF (USDI Fish and Wildlife Service 2011b and 2013), Forest Service sensitive species (USDA Forest Service 2011a) and MIS species identified in the Forest Plan (USDA Forest Service 1986). A total of 24 species were evaluated (table 63). In order to determine the scope of analysis, a preliminary evaluation (Step 3 above) was conducted for each potentially affected wildlife species, and table 64 identifies those species that were considered, but would not be evaluated in detail in the analysis. Species evaluated in detail are identified in table 65.

Table 63. Wildlife species considered

Common Name	Scientific Name	Status
Federally Proposed, Candidate, Threatened and Endangered Species		
Grizzly Bear	*Ursus arctos horribilis*	Threatened, MIS
Canada Lynx	*Lynx canadensis*	Threatened
Black-footed Ferret	*Mustela nigripes*	Endangered
Sprague's Pipit	*Anthus spragueii*	Candidate
Regionally Sensitive Species		
Wolverine	*Gulo gulo luscus*	Proposed
Bald Eagle	*Haliaeetus leucocephalus*	De-listed
Peregrine Falcon	*Falco peregrines anatum*	Sensitive
Black-backed Woodpecker	*Picoides arcticus*	Sensitive
Flammulated Owl	*Otus flammeolus*	Sensitive
Harlequin Duck	*Histrionicus histrionicus*	Sensitive
Bighorn Sheep	*Ovis canadensis*	Sensitive
Gray Wolf	*Canus lupus*	De-listed
Fisher	*Martes pennanti*	Sensitive
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Sensitive
Northern Bog Lemming	*Synaptomys borealis*	Sensitive
Northern Leopard Frog	*Rana pipiens*	Sensitive
Plains Spadefoot Toad	*Spea bombifirons*	Sensitive
Western Boreal Toad	*Bufo boreas boreas*	Sensitive
Management Indicator Species		
Northern Goshawk	*Accipiter gentilis*	MIS
Pileated Woodpecker	*Dryocopus pileatus*	MIS
Hairy Woodpecker	*Picoides villosus*	MIS
American Marten	*Martes americana origines*	MIS
Elk	*Cervus elaphus nelsoni*	Big Game
Mule Deer	*Odocoileus hemionus*	Big Game

Table 64. Wildlife species eliminated from detailed analysis

Common Name	Rationale for Elimination	Determination
Spraque's Pipit	No recent documentation (Montana Field Guide 2011) and the project area lacks large low elevation grassland habitat (USDI Fish and Wildlife Service 2011b).	No Effect
Black-footed Ferret	Outside current range (Montana Field Guide 2011) and project area lacks open grassland/shrub steppe habitat (USDI Fish and Wildlife Service 2011b)	No Effect
Peregrine Falcon	Project area lacks suitable cliffline nesting habitat.	No Impact
Harlequin Duck	Project area is outside its current range (MFWP 2006).	No Impact
Bighorn Sheep	Project area lacks cliff/rocky habitat required by this species. Species not present.	No Impact
Northern Bog Lemming	Project area lacks suitable high elevation sphagnum moss habitat.	No Impact
Northern Leopard Frog	Project area lacks low-elevation standing water habitat.	No Impact
Plains Spadefoot	Outside the current range (Montana Field Guide 2011).	No Impact

Table 65. Wildlife species evaluated in detail

Species	Habitat
Federally Listed Species	
Grizzly Bear	The project area is in the Northern Continental Divide Ecosystem and occurs in two subunits including Arrastra, and Red Mountain. The project area provides suitable foraging and den habitat and Grizzly bears are present.
Canada Lynx	The project area is within occupied core habitat and designated lynx critical habitat.
Regionally Sensitive Species**	
Wolverine	Wolverine are uncommon but have been documented within the combined boundary. Suitable remote forest habitat occurs throughout the northern third of the project area and modeled den habitat exists in the northern portion of the project area.
Gray Wolf	Wolves are known to occur within the general vicinity of the project area. Also suitable den, foraging and rendezvous habitat is present. Wolves have recently been delisted in Montana (USDI Fish and Wildlife Service 2011a) and the gray wolf is evaluated as a Forest Sensitive Species.
Fisher	Documented on adjacent lands, potential suitable habitat exists throughout much of the project area and fisher use is possible; however, the likelihood of occurrence is low based on recent and historic accounts, rareness of the species, etc.
Townsend's Big-eared Bat	There is no documentation of this species in the Stonewall project area and the closest documented Townsend's Big-eared bat location is approximately 30 miles from the project area. While the project area does not provide suitable cave/hibernacula, it does contain suitable foraging habitat.
Bald Eagle	An eagle nest was recently documented in the Beaver Creek drainage, outside the project area, but within the combined boundary (cumulative effects). Suitable foraging habitat also occurs along the Blackfoot River. Although de-listed under ESA, the bald eagle is protected under the Bald and Golden Eagle protection act and is evaluated as a sensitive species.
Black-backed Woodpecker	Although not documented within the project area, it has been documented adjacent to the area in the vicinity of the Snow Talon fire (2003). As a result and considering that the concentrated mountain pine beetle mortality has created suitable habitat, it is likely that the Black-backed Woodpecker (BBW) is present.
Flammulated Owl	While not documented within the project area this species has been immediatelyh to the south, as well as within the combined boundary. Suitable low elevation, open ponderosa pine/Douglas-fir habitat exist is common. .

Species	Habitat
Western Toad	Suitable forested wetland habitat exists within and adjacent to the project area and although not documented, occurrence is likely as adult toads travel long distances overland after breeding.
Management Indicator Species	
Northern Goshawk	The project area contains two active nest sites and suitable nest, foraging and post-fledgling habitat is common.
Pileated Woodpecker	Documented from the project area. Suitable habitat occurs at scattered locations across the project area.
Hairy Woodpecker	The hairy woodpecker occurs within the project area and suitable habitat is widespread.
American Marten	Although not recently documented, suitable habitat is available and presence is possible. Marten have been trapped along Stonewall Creek in recent years and are known to occur near Reservoir Lake and higher toward Huckleberry Pass.
Commonly Hunted Species	
Elk	The project area provides summer, transition and winter habitat and elk commonly use the project area.
Mule Deer	The entire project area provides suitable habitat and deer use is common. Most of the project area provides summer and transition range, whereas winter range is limited to lower elevations.

**- Includes ESA de-listed and candidate species

Wildlife Issues

The following issues were identified as a result of public scoping and used to develop alternatives to the proposed action. Also, these issues as well as other issue indicators identified to measure potential impacts to wildlife from activities in alternatives considered for the project environmental impact statement are displayed in table 66. Effect indicators are collectively used to assess species viability.

- Restoration of vegetation communities
- Grizzly bear habitat impacts
- Elk security cover and the LRMP standard.
- Lynx habitat: Designated Critical Habitat and Stand Initiation Phase acreage
- Wildfire hazard, risk, and fuels
- Habitats including ponderosa pine, western larch and aspen: maintenance or restoration
- Road impacts to elk and grizzly bear habitat as well as disturbance factors

Table 66. Wildlife issue indicators

Species	Indicator
Threatened and Endangered Species	
Grizzly Bear	Effects to individuals and changes in security cover and potential conflicts with humans. Security Core habitat, Open Road Density (ORD) and Total Road Density (TRD) are specific measures used to evaluate changes within the recovery area, whereas changes in cover and forage within and outside the NCDE are assessed.
Canada Lynx	Effects to individuals and acres of stand initiation, multi-story and mid-seral habitat affected in Lynx Analysis Units (LAUs bl-7 and bl-8). Compliance with the Northern Rocky Mountain Lynx Management Direction (2007) standards and guidelines.
Sensitive Species	
Gray Wolf	Effects to individuals and changes in big game. Den, rendezvous and foraging habitat affected.
Wolverine	Effects to individuals and acres of natal denning and foraging habitat. Availability of remote and dispersal habitat and changes in connectivity and human access.
Fisher	Effects to individuals and acres of den, rest and foraging habitat. Changes in human access.
Townsend’s Big-eared Bat	Effects to individuals and acres of and effect to foraging habitat.
Bald Eagle	Effects to individuals, suitable nest habitat affected, effects to reproduction and nest and foraging habitat availability.
Black-backed Woodpecker	Effects to individuals, acres of suitable habitat, changes in quality and distribution of suitable snag habitat.
Flammulated Owl	Effects to individuals and acres of suitable habitat. Short- and long-term changes in the quality of suitable open-canopy habitat, availability of large diameter (>=19 inches) snags.
Western Toad	Effects to individuals, acres of breeding and upland habitat affected.
Management Indicator Species	
Northern Goshawk	Effects to individuals and reproduction. Acres of nest and foraging habitat, nest, foraging and post-fledgling habitat affected, landscape-level changes in habitat. Ability of the project area to support nesting pairs.
Pileated Woodpecker	Effects to individuals and reproduction. Acres of old growth habitat, existing and affected suitable habitat, changes in quality of foraging and nesting habitat, large snag (>=20 inches d.b.h.) availability and changes in project area distribution and use.
Hairy Woodpecker	Effects to individuals and reproduction, acres of suitable habitat, acres of suitable habitat affected, changes in quality of suitable habitat, snag (all size classes) availability. Changes in project area distribution and use
American Marten	Effects to individuals and reproduction. Existing and affected suitable habitat. Changes in the quality of den and foraging habitat, project area distribution and use, and snag and downed woody debris (DWD) availability.

Species	Indicator
Elk	Acres of hiding and thermal cover, habitat effectiveness, acres of security habitat, changes in access and mortality, acres of foraging habitat, and compliance with the Montana logging study. Changes in hunting opportunity.
Mule Deer	Acres of hiding and thermal cover, acres of foraging habitat, changes in project area distribution and use and hunting opportunities.
Migratory Species	
Migratory Birds	Changes (acres) in available habitat (Biophysical settings), compliance with MBTA.

Affected Environment

Wildlife Habitats

Methodology and Process

Wildlife habitats are assessed by looking at existing conditions and changes to biophysical settings and site-level habitats. Biophysical settings are land delineations based on the physical setting (e.g., elevation and aspect) and the potential vegetation community that characterizes the site and are mapped at the landscape scale using geographical information systems (GIS). The Stonewall project area biophysical settings includes: Dry Forests, Cool, Moist Forests, Upper Subalpine Forest (whitebark pine), Mountain Meadow and Shrub, and Riparian communities. Site-level habitats including aspen, snags and downed woody debris (DWD) are based upon Forest Inventory and Analysis (FIA) data from western Montana intensified grid data, and estimates of snag densities from eastside forests (Bollenbacher et al. 2008). More detailed information on biophysical settings and vegetation information collected can be found in the Stonewall Vegetation Project Fire and Fuels Report and the Silviculture Report (Amell and Klug 2015 and Buhl 2015).

Wildlife use of biophysical settings and site-level habitats is based on information provided in the Montana Partners In Flight Bird Conservation Plan (PIF 2000), the Avian Science Center Landbird Monitoring Program (http://biology.dbs.umt.edu/landbird/mpcp/mtpif/TOC.htm) (2006a and 2006b), the Blackfoot Landscape Analysis (USDA Forest Service 1995a), the Montana Natural Heritage Program (http://nhp.nris.state.mt.us), the Coordinated Implementation Plan for Bird Conservation in Western Montana (Montana Steering Committee: the Birds and Burns Network, and Montana's Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005) and the Stonewall Silvicultural Report.

This analysis discusses standing and downed woody debris as it relates to wildlife and wildlife habitat. See the Aquatic Resource Report for consideration of large wood recruitment in aquatic systems, the Soils Report for a discussion of the importance of dead wood for nutrient cycling, and the Fire/Fuels Report for a discussion of fuel loading. Also, the Stonewall Vegetation Project Snag Analysis Report summarizes the methodologies used to assess snags and provides more detail on snag availability.

The Region 1 Connectivity Protocol (USDA Forest Service (1997) was used to set the context and categories relative to connectivity. Connectivity is discussed relative to the types of corridors utilized by wildlife, whereas effects are evaluated by looking at remote forest habitat (i.e., elk security and grizzly core), increased human access, fragmentation and landscape-level conditions.

Species diversity is discussed at the coarse filter scale by assessing changes in habitats of similar vegetation composition and structure.

Changes in structural condition resulting from treatment would result in site-specific changes; therefore, direct and indirect effects on habitats are analyzed across the project area. However, to better evaluate possible changes in habitat across the landscape, cumulative effects are evaluated on that portion of the combined boundary in which biophysical settings data is available (approximately 65,000 acres).

Dry Forest Habitats (Ponderosa Pine and Douglas-fir)

Habitat Description

Dry forest types comprise 5 million out of 25 million total forest acres in Forest Service Region 1. Approximately 4 million acres are located in Montana—primarily east of the Continental Divide in a band running through the southwestern, central, and north-central part of the state at lower to middle elevations (5,300 to 7,350 feet) on both public and private lands.

Wildlife species associated with dry forests that occur in the project area include flammulated owls, goshawks, Hammond’s and dusky flycatchers, and Williamson’s and red-naped sapsuckers, among others; all listed as high priority species by the Intermountain West Joint Ventures (Montana Steering Committee 2005).

This forest community includes open, parkland stands composed almost exclusively of ponderosa pine, with an open understory of shrubs and other herbaceous vegetation at lower elevations. On other dry sites, generally at elevations above the ponderosa pine belt, dry forests include a combination of ponderosa pine, Douglas-fir or grand fir, whereas dry forest sites composed exclusively of Douglas-fir occur on sites that are usually too cold for ponderosa pine (PIF 2000).

Prior to the European settlement, fire intervals in the dry forest types ranged from 5 to 25 years (Brown and Smith 2000). These frequent fires were usually of low intensity and promoted a forest structure of open, uneven-aged ponderosa pine or ponderosa pine/Douglas-fir stands (Arno and Gruell 1983). Douglas-fir encroachment into grasslands was rare and limited to periods with long fire return intervals (Gruell 1983). Due to the increased number of immature trees, dry forests have also changed from stands that were previously open, single-storied and patchy, to stands that are currently dense and relatively continuous across the landscape (Fischer and Clayton 1983; Gruell 1983; Losensky 1993). As a result the rich grass, forb and shrub components have been replaced with young conifers, needle mats and sparse ground vegetation.

In the absence of fire, the cool dry forests in central Montana have expanded in previously nonforested grasslands and shrubland habitats. Aspen stands have deteriorated due to competition from Douglas-fir and ponderosa pine and old growth forest has declined due to logging of older trees, particularly low-elevation ponderosa pine (Fischer and Clayton 1983, Gruell 1983, Losensky 1993).

This change in fire frequency has also resulted in shifts in wildlife species composition today, from what occurred in dry forests historically (PIF 2000). For example, open grown pre-settlement stands provided a unique combination of overstory structure and ground level forage for herbivores of all sizes (Knight and Wallace 1989). This contrast most stands today, which exhibit closed or open canopies with cluttered, multi-layered understories. This structure provides more hiding cover and structural diversity, but less forage than historic stands. Changes in stand structure have also resulted in modifications to the bird community. For example, due to the increased tree density and canopy cover, migratory species such as the Townsend’s warbler and ruby-crowned kinglet are more common today (Hutto and Young 2002, PIF 2000). Conversely, species that were closely tied to the late-seral, open, dry structure that occurred historically such as the flammulated owl, Lewis’s woodpecker, chipping sparrow, Cassin’s finch, Hammond’s flycatcher and red-crossbill have declined and are currently listed as priority I and II species in Montana (Hayward and Verner 1994, PIF 2000). Also the flammulated owl either does not occur or is much less common in dry forests today (PIF 2000).

Project Area Dry Forest Habitat

Fire Regime Condition Class (FRCC) biophysical setting data indicate that dry forest habitats dominated by ponderosa pine and dry Douglas-fir comprise approximately 7,742 acres and 5,579 acres respectively of the Stonewall Project area, with ponderosa pine at lower elevations between 4,400-5,500 feet, and a ponderosa pine/Douglas-fir mix at elevations of 5,500-6,000 feet.

Ponderosa pine was historically more prevalent in the project area. However due to fire exclusion, dry sites within the project area today include primarily a mixture of ponderosa pine and Douglas-fir. Also because of years of fire suppression and past harvest, many dry forest stands have been changed from stands that were previously open, single-storied and patchy, to stands that are currently dense and relatively continuous across the landscape (Fischer and Clayton 1983, Gruell 1983, Losensky 1993). These stands are more susceptible to stand-replacing fires (IWJV 2005), which has increased recently due to the MPB outbreak.

The reference fire regime for this setting was one of high frequency (a 22-year mean fire return interval) and low intensity and severity (24 percent overstory mortality). Currently, the fire frequency is much higher (70 years) than the reference and expected severity is higher than reference conditions (70 percent) (Buhl 2015).

Cool-Moist Habitats

Cool-moist habitats include Douglas-fir/lodgepole pine communities at mid-elevations and lower subalpine fir at mid- to upper elevations. The following is a discussion of each.

Moist Douglas-fir/Lodgepole Pine

Douglas-fir forests are difficult to classify and describe, because interior Douglas-fir (var. *glauca*) has the broadest ecological amplitude of any western tree (Arno 1991). It is moderately shade-tolerant, so it can be a climax species in some areas as well as being a common seral species in many habitat types. The moist Douglas-fir stratum covers the transition zone between warm, dry, lower elevation forests dominated by Douglas-fir and ponderosa pine and the cool, moist higher elevation forests dominated by lodgepole pine and subalpine fir.

Historically, these stands were co-dominated by Douglas-fir and lodgepole pine, and experienced mixed severity fire regimes where fire intervals averaged 30 to 100 years (Arno 1980, Barrett et al. 1991, Brown et al. 1994, Arno and Fischer 1995). Mixed severity fire regimes are marked by variability with some trees dying and many surviving (Brown 1995). The result was a patchy, erratic pattern that fostered development of diverse plant communities and wildlife habitats within forested stands and across the landscape as a whole (Barrett et al. 1991).

Cool/Moist Lower Subalpine Forest

Within the lower, subalpine community, lodgepole pine is generally the most common conifer with Douglas-fir, subalpine fir, and Engelmann spruce occurring as well. Whitebark pine occurs in some of the upper elevations of this setting. Particularly moist sites are dominated by subalpine fir and spruce. Engelmann spruce is prominent particularly on north slopes, in draws, and along streams and other riparian areas. These forests occur at higher elevations in cool, moist conditions, and they occupy all aspects.

Historically, fires were relatively infrequent but often burned with high intensity, replacing entire forest structures over extensive areas. Young forests were initially dominated almost entirely by lodgepole pine because of its ability to regenerate after stand replacing fires. However, the structure of older forests varied. Because lodgepole is a thin-barked tree not likely to withstand fire, where periodic underburning did occur, large, sometimes widely spaced overstory trees with thick understory vegetation occurred. In areas that were not periodically burned, heavier fuels and sub-alpine fir developed on the site, and these areas were highly susceptible to stand-replacing fires.

Both Communities

The combination of logging at the turn of the century and fire-suppression has produced a more homogeneous landscape in the cool, moist forest habitat today than occurred historically (PIF 2000). In the past, stands often formed a complex and intricate mosaic on the landscape as a result of the highly variable fires that occurred. Because succession changes forest structure most rapidly in the early decades, it has only taken a few decades for fire suppression to allow large expanses of continuous forest to form across the landscape as most stands reach a closed-canopy stage (Tande 1979).

Priority bird species historically associated with the more diverse structure characteristic of these communities include sharp-shinned hawk, Northern goshawk, Williamson’s sapsucker, pileated woodpeckers, Olive-sided flycatchers, Cassin’s vireo and Townsend’s warbler, although specialized habitat and structures such as snags, riparian areas, large woody debris or edge are necessary for some species.

Species more commonly found in the more homogeneous mid-seral and late-seral closed-canopy forest that exists today include species such as the red-breasted nuthatch, mountain chickadee, ruby-crowned kinglet, gray jay, dark-eyed junco, pine siskin, red squirrel, deer mouse and mule deer.

Project Area Cool/Moist Habitat

The moist Douglas-fir forest is found on approximately 24 percent (5,862 acres) of the Stonewall Project area. This community is found on all aspects although most frequently on north and east aspects. The cool moist sub-alpine fir community occurs on approximately 3,300 acres or 14 percent of the project area and ranges in elevation from 6,800 to 7,800 ft.

The reference fire regime was one of high frequency (a 30-year mean fire return interval) and low intensity and severity (10 percent overstory mortality). Currently, the fire frequency is much higher (70 years), and the expected severity is higher (70 percent) than the reference condition (Buhl 2015).

Upper Sub-Alpine Forests (Whitebark Pine)

While the following provides a brief discussion of whitebark pine, a more detailed assessment can be found in the Stonewall Vegetation Project Silvicultural Report (Amell and Klug 2015)

Habitat Description

Whitebark pine (*Pinus albicaulis*) is a subalpine conifer that is relatively slow-growing, intolerant of shade, but tolerant of poor soils, steep slopes, windy exposures, and cold environments (Arno and Weaver 1990). The major mechanisms for dispersing whitebark pine seed depends primarily upon the seed harvesting and caching behavior of Clark’s nutcracker (*Nucifraga columbiana*) (Tomback 1982, Hutchins and Lanner 1982), although a number of other birds and small mammals also utilize the seeds and store them as winter food. Nutcrackers in Montana typically occupy conifer forests dominated by whitebark pine at higher elevations, and ponderosa pine, limber pine and Douglas fir at lower elevations (Montana Fish Wildlife and Parks 2013). While overall populations of Clark’s nutcrackers have been stable or slightly increasing, sharp local declines have been noted in northwestern Montana and the cascades.

These changes may be due to recent pine beetle infestations and the arrival of white pine blister rust, both of which kill the whitebark pines that many nutcrackers depend on (Cornell Lab of Ornithology 2012).

Whitebark pine can be found growing in a wide range of plant communities. It can be found growing in small stands at higher elevations or as a co-climax species on sites capable of supporting shade tolerant species such as subalpine fir. On moister subalpine fir habitat types, it can be present as a major seral species, whereas it is a minor component on dry sites.

Whitebark pine's presence as a seral species in subalpine fir habitat types is maintained by disturbances, mainly fires (USGS 2008). Prior to 1900, fires burned through whitebark pine forests at average intervals ranging from about 30 to 400 years, usually with mixed-severity (Barrett et al. 1991, Brown et al. 1994, Keane and Parsons 2007, Tomback et al. 2001), although the longest fire return intervals were associated with a stand-replacing fire regime (Keane 2008). Some whitebark pine stands have been maintained by low intensity fires that kill the sub-alpine fir. Mixed severity fires, which are necessary to create conditions that allow nutcrackers to cache seeds have been absent from the landscape. Consequently whitebark pine has been declining across its range (Kendall and Keane 2001).

In addition to fire suppression, white pine blister rust has led to the most rapid decline in whitebark pine. Impacts from the disease have been highest in the more mesic parts of its range; although all stands can be considered to be at risk. Whitebark pine has also been affected by mountain pine beetle and increased competition, and collectively these factors have all contributed to the rangewide decline of this species.

With large seeds high in fats, whitebark pine trees are an important source of food for many animal species. Wildlife species that eat whitebark pine seeds include woodpeckers, jays, ravens, chickadees, nuthatches, finches, chipmunks, ground squirrels, bears and probably mice (Hutchins and Lanner 1982, Tomback et al. 2001). Pine squirrels (*Tamiasciurus spp.*) harvest and cache whitebark pine cones in middens (Hutchins and Lanner 1982). Whitebark pine seeds serve as an important food source for grizzly bears (*Ursus arctos*) and black bears (*U. americanus*) which raid the seed middens (Kendall 1983). Whitebark pine are long-lived and can grow large in diameter, so also provide valuable snag habitat.

Project Area Upper Subalpine Forest Habitat

The upper subalpine fir community exists on approximately 580 acres or 2 percent of the project area. Although this community occurs largely at elevations above 7,800 feet, it is commonly found at lower elevations down to approximately 6,900 feet. Project area whitebark pine is highly infected by white pine blister rust and is considered seral to subalpine fir. As a result, it depends on fire to maintain its dominance (Keane et al. 2001, Kendall and Keane 2001). In the absence of fire, subalpine fir has increased in presence and the combination of increases in subalpine fir and associated whitebark pine mortality, and lack of regeneration due to white pine blister rust and mountain pine beetle have resulted in a large decline in whitebark pine.

The reference fire regime was one of infrequent high-intensity and mixed-severity fires. The current frequency and severity is not substantially different from the reference condition (Buhl 2015).

Riparian Habitats

Habitat Description

Riparian habitats typically support more species of breeding and migratory birds than any other terrestrial habitats in the West. They are diverse, dynamic and complex habitats and are sites of biological and physical interaction at the terrestrial/aquatic interface (Kaufman et al. 2000). Riparian zones have a high degree of biodiversity and the microclimate of riparian zones is also influenced by its position on the landscape, which is different than the surrounding forest (Thomas et al. 1979).

While riparian habitats occur in a variety of communities (e.g., conifer and hardwood) they make up a relatively small amount of the landscape. However because of the proximity to water and associated habitats, they receive a disproportionate amount of wildlife use. For example riparian areas provide more breeding habitat for birds than any other vegetation type in North America (Kaufman et al. 2000). In the Rocky Mountain Region, they contain more listed and vulnerable bird species than any other habitat type. Also numerous landbird species are relatively restricted to the shrubs or deciduous trees associated with riparian environments (Hutto and Young 2002).

Reptiles use riparian areas for foraging, overwintering, and migration. Most amphibians require riparian areas and aquatic habitat for all (e.g., spotted frogs, tailed frogs) or part (e.g., western toads) of their life cycle. Because of their limited mobility, continuous riparian zones are important for dispersal and migration to other unoccupied habitat. Mammals also disproportionately use riparian zones, because of the high structural diversity, proximity to water, and favorable microclimates that create high plant diversity that results in a varied and abundant forage supply. Consequently, riparian areas serve as migration routes between summer and winter range for big game and provide travel corridors between habitats for many terrestrial species such as carnivores, birds, and bats.

Birds that are known to occur in the project area commonly associated with riparian habitat include ruffed grouse, cedar waxwings, yellow warblers, cordilleran flycatchers, McGillivray’s Warbler and song sparrows. Fire return intervals can be longer in riparian zones and mammals such as fisher and wolverine also prefer riparian habitat due to the increased cover and downed woody debris that often occurs there (Self and Kearns 1992 *in* Ruggerio et al. 1994).

Project Area Riparian Habitats

The Stonewall Vegetation Project area contains a small amount of the riparian biophysical setting (24 acres), 66 miles of stream and 26 acres of National Wetland Inventory (NWI) wetland. Because many wildlife species select habitat in close proximity to water, for the purpose of this analysis, riparian habitat is defined as lands within 100 feet of a stream or wetland. Stream riparian habitat exists on almost 1,700 acres or 7 percent of the project area, whereas wetland riparian habitat exists on approximately 300 acres. So collectively the project area contains approximately 2,000 acres of riparian habitat.

Aspen

Habitat Description

Aspen occurs as isolated relatively pure stands commonly associated with conifers along water courses. It is often but not always associated with riparian or more mesic upland sites and is relatively rare in Montana when compared to other Rocky Mountain States (PIF 2000).

Aspen reproduces primarily from sprouting following a disturbance, and fire is the primary factor that perpetuates aspen. In the absence of fire, remaining aspen trees eventually lose vigor, fail to sucker (reproduce), and are eliminated from the community. Consequently without wildfire, aspen will be replaced by coniferous forest (Stam et al. 2008). Fire suppression has resulted in a decrease in the abundance and distribution of aspen stands within the Stonewall project area.

Aspen is an important component of the vegetation of Montana, and whether in pure stands or mixed with conifers, aspen provides habitat for a wide variety of wildlife and adds to habitat diversity. It is often the only broad-leafed tree within coniferous forests and therefore provides unique foraging substrates for a variety of insectivorous birds (PIF 2000, DeByle 1985, Shepperd et al. 2006). The suckers, twigs and bark are used by wintering ungulates, particularly deer, elk and moose. Snowshoe hares and cottontail rabbits feed on the twigs and buds, while ruffed grouse are highly dependent on the buds in winter. Aspen also provides cavities and snags for cavity-dependent species (PIF 2000), and Birds and Burns surveys conducted from 2002 through 2006 south of the project area found that hairy woodpeckers are strongly associated with aspen on the HNF (Bate 2003; Bate 2004; Bate 2005a and b; Bate 2007, Mosher and Saab 2009). Also many cavity excavators select aspen trees at remarkably high rates compared to their availability (Hutto 1995).

Project Area Aspen Habitat

Historically, aspen was widely scattered in the project area (based on remnant stands and range maps). Stands were generally associated with seeps and springs, riparian areas and other moist sites. Under naturally occurring wildfires, aspen stands provided a diversity of structure and size classes. Fires were frequent enough that it was maintained across the landscape. Due to conifer encroachment, age and fire suppression, existing aspen stands are largely decadent with little or no reproduction. Remaining aspen are widely scattered across the project area.

Mountain Meadow and Shrub

Big sagebrush is the dominant mountain shrub and often occurs as a sagebrush/fescue or sagebrush/wheatgrass community. Sagebrush plays an important role for several wildlife species. It is an important winter food as it may be the only source of green vegetation available. It provides cover for mule deer and breaks up snow pack, providing access to grasses. Throughout the rest of the year, it is an important habitat component as forage, protective cover, and nesting habitat (Ritter and Paige 2000). Sagebrush has always been a common habitat in drier, lower elevation valleys in the West, where distribution and patchiness was a result of natural moisture and fire regimes (Paige and Ritter 1999). Sagebrush and associated perennial grasses and forbs provide food and cover for many wildlife species (Cornell Lab of Ornithology 2012).

Mountain meadows typically consist of native bunchgrasses and forbs, which are often interspersed among shrubs. The herbaceous and shrub structure provides habitat for a variety of species, including migratory birds, deer and elk. These areas can be particularly important for big game when they occur at lower elevations, because of the forage they provide on transition range.

Sagebrush and open-land habitat are decreasing across the West (Grove et al. 2005). Without disturbance, conifers are able to out-compete herbaceous species for sunlight, nutrients and water. Large-scale changes in land use have altered the distribution and condition of these communities. Nonnative species invasions have also reduced habitat.

Project Area Mountain Meadows and Shrub Habitat

Mountain meadows and shrubs currently occur on approximately 700 acres or 3 percent of the project area, whereas shrub habitat exists on 138 acres. Approximately half of the existing habitat was created during the Keep Cool fire in 2006. The remainder is widely scattered at upper elevations in the headwaters of Keep Cool and Beaver Creeks. Due to conifer encroachment, this community has been declining.

Dead Wood

Methodology

Forest and regional management direction, as well as the process and assumptions used to identify snag availability are discussed in detail in the Stonewall Old Growth and Snag Analysis Report (USDA Forest Service 2012c). The Northern Region Snag Protocol Team developed the Northern Region Snag Management Protocol (NRSMP) (USDA FS 2000a). The NRSMP was meant to provide flexible direction rather than blindly following established snag retention and recruitment standards given.The information provided in Bollenbacher et al (2008) does not set forth required direction, but rather provides relatively current snag data for consideration. The HNF uses this report to draw conclusions as to an appropriate level of snags on the landscape, as well as in determining appropriate and realistic snag management targets.

In 2007 and 2008 the HNF measured FIA grid intensification plots within the Stone Dry analysis area. These plots included all mortality through 2008 and were used as a base level of snags per acre greater than seven inches d.b.h. for forested land. Because past harvest/regeneration units cannot be expected to have many, if any snags and are not represented in the FIA grid intensification plots used, we assumed that past harvest/regeneration treatment areas would have no snags and computed the 2008 snags per acre accordingly. Projected snags following treatment assumed that the Forest Plan standard of two snags per acre would remain in sites that received a mechanical treatment, whereas snags created by future burning (outside mechanical sites) were based on Forest Vegetation Simulator (FVS) runs. The Region one summary database is used to estimate dead wood.

Habitat Description

Dead wood, including both standing and downed woody debris is discussed because many species, including threatened, endangered and sensitive species rely on this important habitat component. Dead wood contributes to biological richness in many ways: as substrate, cavity sites, foraging sites, nesting or denning sites, food storage sites, runways and cover or shelter (Bull et al. 1997). It is estimated that about 0.33 percent of the bird and mammal species that live in the forests of the Rocky Mountains use snags for nesting or denning, foraging, roosting, cover, communication, or perching. Rose et al. (2001) lists 57 wildlife species plus 4 species groups associated with snags, and 20 wildlife species associated with hollow living trees. In addition, large snags and downed wood play central roles in diverse ecosystem processes and functions such as nutrient recycling, shelter for growing trees, and habitat for wildlife and fish (Rose et al. 2001).

Snags are often examined in terms of cavity use by different wildlife species. There are two types of cavity users: primary and secondary. Primary cavity users excavate their own cavities, whereas secondary cavity users occupy those cavities already created. Hence it is important to distinguish between types of snags (Thomas 1979). For example, pileated woodpeckers and black-backed woodpeckers excavate trees with hard exterior sapwood shell and decaying heartwood. Weaker excavators, e.g., red-breasted nuthatches and chickadees, select trees with softer exterior wood such as those created by armillaria root rot and other saprophytic fungi (Rose et al. 2001). Woodpeckers usually excavate a new cavity each year (Bull et al. 1997), therefore old cavities are continuously available for secondary cavity users.

Reliance on dead wood habitat occurs at a variety of scales, from large landscapes, to small patches, to individual snags or downed logs. More mobile species that depend on dead wood habitat include black bears, Canada lynx, wolverines, marten, fisher, bats, woodpeckers, and owls. Less mobile species that depend on dead wood include snowshoe hares (the primary prey of Canada lynx), red-backed voles (the primary of prey of marten, fisher, boreal owl, northern goshawk), and shrews (Bull and Blumton 1999, Brown et al. 2003).

The number, species, size, and distribution of snags also affect snag-dependent wildlife. Large-diameter snags are particularly important because they occur in fewer numbers and many species require large diameter snags for nesting. Large diameter snags also remain standing longer and are much more likely to develop suitable decay conditions for cavity-using species (McClelland et al. 1979, Bull et al. 1997).

Ponderosa pine, western larch, Douglas-fir, and deciduous tree snags are the species predominately used by cavity-using birds and mammals in the Stonewall Project area. Most are relatively resistant to windthrow and are less likely to require felling for safety concerns. Smaller-diameter snags also get some use as nest habitat by some species, and can play an important role by helping to keep other snags standing (Russell et al. 2006).

Downed trees and other woody material are critical for many species (Maser et al. 1979 *in* USDA Forest Service 2008a). In the Pacific Northwest, 47 vertebrate species respond positively to downed wood (Bunnell et al. 2002). Downed logs and stumps are required for denning and resting, are vital for hunting below the snow in winter (Buskirk and Ruggiero 1994), and are also used as travel cover, particularly when living plant cover is absent. American marten often den and forage in the under-snow cavities that occur under downed logs. Canada lynx, fisher, and wolverine dens are associated with abundant woody debris, usually large-diameter logs (Bull et al. 2001). Winter wrens do most of their feeding underneath suspended logs and several amphibians and reptiles make use of large woody debris for shelter and breeding sites (Bull et al. 1997). Many ant species that need large-diameter downed logs are major predators of defoliating insects such as western spruce budworm (Torgersen and Bull 1995). Longer, large-diameter downed trees are generally most important because they can be used by a far greater range of species. In addition, they provide stable and persistent structures as well as better protection from weather extremes. However, a variety of sizes and decay classes are needed in downed wood “in order to conserve functional processes that foster sustainable forest ecosystems” (Torgersen and Bull 1995).

Standing and downed dead trees have many ecological roles in a landscape recovering from wildfire (Beschta et al. 1995, Saab and Dudley 1998, Smith 2000, Brown et al. 2003, Beschta et al. 2004, Saab et al. 2004). The snags and down logs that result from fire serve a vital role in the structure and function of healthy forest ecosystems and play an important role in post-fire recovery and long-term site productivity. Also, Hutto (1995) found that 15 species of birds were more frequently found in post-fire habitats than in any other major cover type in the northern Rocky Mountains.

Forest and Project Area Dead Wood

Broad Scale Analysis

The abundance and distribution of snags is dynamic due to natural processes and disturbances including fire, insects and disease and forest management. Broad scale analysis captures these disturbance processes and the project area and third-order drainages were examined to assess the distribution and pattern of snags associated with the project and Forest Plan. Table 67 displays the distribution of snags greater than seven inches for the stonewall project area and the Forest as a whole.

Bollenbacher et al (2008) describes the density and distribution of snags within and outside wilderness/roadless areas, by habitat type groups, dominance groups and seral stages. The authors used the most complete FIA data available, although the dataset did not include all the plots currently available in the Forest summary database. Results show that on the HNF, large snags are mostly found in the cool type group, although larger snags were less common in all groups. This is due to (1) fewer trees living to an older age, (2) as trees age, they grow slower, never reaching very large diameters and (3) the inability of systems to contain large old trees and snags due to various types of disturbance which kill them over time (Bollenbacher et al 2008). In the Stonewall project area, warm, cool and lodgepole pine groups are best represented with lodgepole pine is experiencing a pulse of snags due to MPB.

Bollenbacher et al (2008) summarize snags in wilderness and roadless areas separately to make a distinction between areas that have been influenced by management and those that have not. The authors recognize uncertainty associated with climate and fire suppression, but note that this is the best quantitative data available to represent natural forested ecosystems. This work suggest that the snags in roadless/wilderness areas may represent a natural snag conditions, and the snags in those areas provide a reasonable target distribution. Forest Plan snag targets (2 per acre by 3rd-order drainage, 0.2 to 1.3 per acres at the treatment unit scale) are relatively consistent with snag distribution found in wilderness/roadless areas, although a bit high for large diameters and a bit low for small diameters. Both sources suggest that large snags (greater than 20 inches d.b.h.) are naturally rare.

Large wildfires have created snags and on over 200,000 acres on the Forest since 1970. Insect mortality also creates snags and aerial detection surveys (ADS) show that MPB infestation has created snags in ponderosa, whitebark, limber and lodgepole pine. Seral stage and spatial distribution are important characteristics of snags. For example, cool and lodgepole pine groups have more snags in the early seral stage due to a greater proportion of stand replacing fires and composition of species intolerant to fire. The warm types also show an increase of large diameter snags in the early seral stage, perhaps due to fire's role as a stand replacement agent becoming more pronounced through fire suppression, climate and/or beetle outbreaks. All biophysical settings show fewer snags during mid-seral stages as snags transition to dead wood. Also there is generally an increase in live large trees and snags as forest mature (Bollenbacher et al. 2008).

Project Area Snags

The process used to identify the baseline level of snags for the project area is summarized under methodology and within the FIA Intensification plots, there were an average of about 40 snags per acre greater than or equal to 7 inches d.b.h., which is 20 times the Forest Plan requirement of providing 70 percent of optimum. Snags are also well distributed and snag numbers greater than or equal to seven inches in 2011 were 45 snags per acre for drainage 0203, 41 snags per acre for drainage 0204A and 43 snags per acre for the entire project area (USDA FS 2012c). Consequently snags currently occur in a variety of size classes and are widespread and abundant across the Stonewall project area.

Table 67 summarizes snags by size class within the Stonewall Project area, whereas figure 67 displays general snag distribution

Table 67. Snag distribution data by size class from 2008 FIA plots

Diameter (d.b.h.) Class	Project Area Average Snags per Acre	Forestwide
7-11	26	26
12-19	13	7
>=20	1	1
Total	**40**	**33**

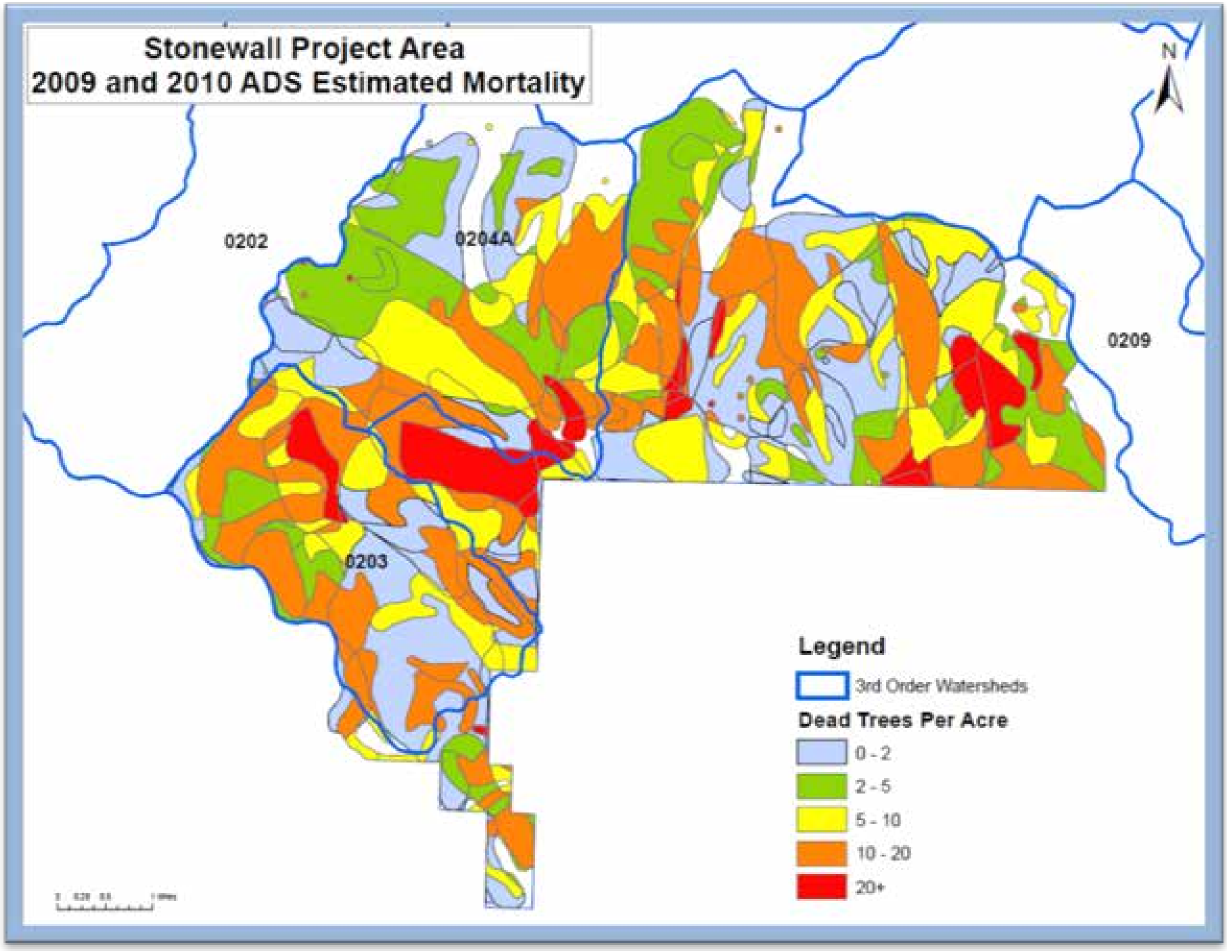


Figure 67. Project area snag distribution

Down Wood

Down wood habitat is estimated in tons per acres from the R1 summary database, as well as from stand surveys. Table 68 displays down wood for the Blackfoot landscape, which includes the project area. Down wood within treatment units is variable. While some young stands contain less than 5 tons per acre, most stands contain between 5 and 20 tons per acre and stands with concentrated lodgepole mortality can contain up to 30 or 40 tons per acre.

Table 68. Down wood Across the Blackfoot Landscape

Down Wood Size	Blackfoot Landscape (tons per acre)
1 hour fuels (<1/4 inch)	0.2
10 hour fuels (1/4 to 1 inch)	0.94
100 hour fuels (1 to 3 inches)	1.86
1000 hour fuels (> 3 inches)	9.51
Total	**12.51**

Landscape Connectivity and Fragmentation

Connectivity refers both to the abundance and spatial patterning of habitat and to the ability of animals to move from patch to patch of similar habitat (USDA Forest Service 1997). Corridors are a means by which connectivity is provided and are defined as strips or stepping stones of "hospitable territory traversing inhospitable territory providing access from one area to another" (USDA Forest Service 1997). The effectiveness of a corridor depends upon the species in question, the type of movement, and the type of corridor (WHCWG 2010). Animals need connectivity to forage within their home range, for dispersal to new home ranges, and for migration between locations.

Connectivity as a concept is being increasingly explored in conservation and is also an area of controversy. While there is no empirical evidence to support the concept of corridors many conceptual models have been built to project connectivity across landscapes (WHCWG 2010).

The Northern Region Connectivity Protocol (USDA Forest Service 1997) provides a framework for describing corridors and the effects of Forest projects and other human activities. Of the five types of corridors outlined in the protocol, four apply to the Stonewall Project area: season migration corridors, dispersal/emigration corridors, travel corridors, and invasive corridors.

Season migration and cyclic corridors: While the project area occurs in well-established continental corridors such as the Central flyway, locally, the most obvious examples of seasonal migrations are spring and fall movements by native ungulates between winter and summer ranges. Historically these routes were dictated by topography, snow conditions, and the availability of resources (particularly forage, water, and cover). Over the past 150 years, these routes have shifted in response to human development. In part, they follow the old resource/topography-driven routes but divert as necessary to avoid roads and other centers of human activity and to take advantage of cover. Wildfire and insect and disease such as concentrated MPB mortality have also affected landscape and watershed level connectivity resulting in local shifts in migration corridors. These corridors are maintained by minimizing human access and fragmentation, and by ensuring contiguous forested upland and riparian areas are available across the landscape.

Travel corridors are local routes established by individual animals or groups of animals to move within home ranges between foraging habitat, cover, breeding sites, and so on. As with local seasonal migration, these routes may shift in response to human activity or landscape-level changes from wildfire and insect and disease infestation. The Stonewall Project area provides connectivity between more remote lands to the north (e.g., Scapegoat Wilderness) and the Blackfoot River and lands to the south extending along the continental divide. The Blackfoot River is an important corridor for species moving up and down the river corridor as well as for movement between habitats to the north and south. Like seasonal and migration corridors, maintaining forested conditions while minimizing human access and development help to maintain existing travel corridors.

Dispersal corridors promote movement into unoccupied habitats. Dispersal behavior is most common when density is too high within an area to support the population, resulting in natural colonization of suitable but unoccupied habitat elsewhere. Because the project area adjoins large blocks of more remote habitat to the north and the Blackfoot River to the south, it provides an important dispersal corridor for a wide variety of species, including Canada lynx, grizzly and wolverine.

Invasive corridors may be continental (e.g., eastern blue jays moving across the Great Plains via wooded river corridors), or local (e.g., cowbirds following cattle trailing up onto National Forest System land). These corridors may affect biodiversity in local ecosystems that have inadequate resistance to invaders, particularly in the case of exotic weeds such as knapweed or leafy spurge. Maintaining landscape-level conditions and minimizing fragmentation is necessary to ensure that invasive corridors are not established.

Fragmentation is generally considered a change in landscape structure that leads to smaller patch sizes, less interior habitat, and greater distances between patches which can lead to sub-population isolation (Reed et al. 1996, Tinker et al. 1998, Temple and Wilcox 2000).

Fragmentation can affect animal populations by decreasing species diversity and densities due to the smaller patches of habitat created, as well as by increasing edge habitat and effects. Edge is the interface between forest and nonforest, whereas an ecotone is the zone on either side of the edge that is influenced by the transition between contrasting vegetation types (Thomas 1979). Edges and ecotones often support a more diverse array of wildlife species than either of the adjacent habitats alone. Elk, deer and black bears often frequent edges because the forested stands provide cover whereas the openings provide forage. Edges also provide habitat conditions conducive for nest parasites (e.g., cowbirds), invasive species and nest predators (e.g., great horned owls). Consequently increased fragmentation can adversely affect a variety of species including neo-tropical migratory birds as well as increase risks from invasive species. When evaluating effects of fragmentation, landscape conditions such as the amount of intact forest habitat and nonforest habitat need to be considered.

Project Area Changes

Connectivity within the Stonewall Project area and combined areas have been affected by recent wildfires and insect and disease activity. The Snow Talon fire in 2003 (northeast of the project area), eliminated much of the mature forest on most of the 23,000 acres affected. There has also been a reduction in closed canopy (i.e., greater than 40 percent canopy closure) forest due to recent MPB mortality. Prior to the recent mortality approximately 81 percent of the project area was characterized by relatively closed canopy conditions (i.e., greater than 40 percent canopy closure, whereas post-kill, closed canopy forest is reduced to approximately 19 percent of the project area. While forested connectivity is maintained and standing dead trees continue to provide cover for many species, use of the area by species such as fisher that prefer closed canopy habitat would be affected.

Threatened and Endangered Species

Canada Lynx

Methodology

The Helena National Forest Land and Resource Management Plan was amended in March 2007 by the Northern Rockies Lynx Management Direction (NRLMD) (USDA Forest Service 2007b). This multi-region amendment established management direction to conserve and promote the recovery of the Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System lands, while preserving the overall multiple use direction in existing plans. This management direction incorporated new science on lynx and was based on recommendations in the Lynx Conservation Strategy Assessment (LCAS) (Ruediger et al. 2000). The NRLMD avoids or reduces the potential for projects proposed under Forest Plans to adversely affect lynx through a suite of standards and guidelines that promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations.

Following development of the Canada Lynx Conservation Assessment and Strategy, the Forest Service created maps delineating lynx habitat across National Forest System lands and defined Lynx Analysis Units (LAU) for use in analyzing individual project effects to that habitat.

- The modeling of lynx habitat components, based primarily upon elevation and presence of potential boreal forest vegetative types, was done at the landscape scale and used the best information available. The process used for modeling the different lynx habitat components can be found in the project file and used categories for lynx habitat structure described in the USDI Fish and Wildlife Service Biological Opinion (BO) (USDI Fish and Wildlife Service 2007b) and NRLMD (USDA Forest Service 2007b). Lynx habitat estimates and maps were derived from R1-VMAP and Pfister et al. (1977). Methodologies and assumptions associated with this data are described in; Pfister et al. 1977, R1 Multi-level Vegetation Classification System and its Relationship to Inventory Data, the Region 1 Existing Vegetation Map Products (2009) and the Eastside R1-VMAP Accuracy Assessment (2010).
- LAUs were developed to organize lynx habitat across the landscape into discrete units for analysis purposes. Each individual LAU is intended to be large enough and contain sufficient amounts of lynx habitat to represent the home range of a breeding female lynx (Ruediger et al. 2000). Watershed boundaries and other discrete landscape features were generally used to delineate LAU boundaries. The LAU (or group of LAUs) affected by a project is used as the analysis unit upon which direct, indirect, and cumulative effects analyses are performed.

For the Stonewall Vegetation Management Project, two LAUs, BL-07 and BL-08, are addressed as the analysis area. The Stonewall Vegetation Management Project area is fully contained within these two LAUs, and no other LAU’s are affected by the project. Because most NRLMD direction is applied at the LAU level, and the lynx habitat within each LAU has been affected differently by recent wildfire and other landscape-level influences, direct and indirect project effects are evaluated in this analysis by individual LAU, whereas cumulative effects are evaluated across the combined LAU boundaries.

The NRLMD utilizes classifications of National Forest System lands as “occupied” or “unoccupied” by lynx, based on the Amended Lynx Conservation Agreement between the Forest Service and US Fish and Wildlife Service (USDA Forest Servoce and USDI FWS 2006). These definitions are as follows:

- Mapped lynx habitat is considered occupied by lynx when:
    - There are at least 2 verified lynx observations or records since 1999 on the National Forest unless they are verified to be transient individuals; or
    - There is evidence of lynx reproduction on the National Forest
- Areas of lynx habitat not meeting the definition of “occupied” are considered unoccupied.

The NRLMD further classified lynx habitat on National Forest System lands based on the Lynx Recovery Outline (USDI FWS 2005) with respect to their status as core, secondary or peripheral lynx habitat. Definitions of these classifications are provided below:

- **Core areas** have both persistent verified records of lynx occurrence over time and recent evidence of reproduction.
- Areas classified as **secondary areas** are those with historical records of lynx presence with no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and/or reproduction. If future surveys document presence and reproduction in a secondary area, the area could be considered for elevation to core. Secondary areas may contribute to lynx persistence by providing habitat to support lynx during dispersal movements or other periods, allowing animals to then return to “core areas.”
- In **peripheral areas** the majority of historical lynx records is sporadic and generally corresponds to periods following cyclic lynx population highs in Canada. They contain no evidence of long-

> term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations.

From a lynx management perspective, the Stonewall Vegetation Management Project area is identified as occupied, core lynx habitat. Therefore, all applicable standards and guidelines in the NRLMD that apply to proposed treatments are addressed (by individual LAU, where applicable) in this analysis. The project area is also located within designated lynx critical habitat (USDI FWS 2014; USDI FWS 2009a). Project effects to designated critical habitat are assessed separately using the combined LAUs as the analysis unit.

Species Status and Biology

The population, distribution, life history, habitat status and recovery objectives for Canada lynx in Region 1 are detailed in Ruggiero et al. (1999), Ruediger et al. (2000), USDI Fish and Wildlife Service (2006) and USDI Fish and Wildlife Service (2007b). The following is a brief summary of lynx habitat preferences and biology.

Canada lynx are medium-sized cats associated with boreal forests, whose distribution and abundance are linked to snowshoe hare, their primary prey (Ruediger et al. 2000). In Montana, lynx habitat generally consists of coniferous forests (lodgepole pine, subalpine fir, and Engelmann spruce), containing a mix of seral stages. Drier forest types (e.g. ponderosa pine and climax lodgepole pine) do not provide suitable habitat (Ruediger et al. 2000, USDI Fish and Wildlife Service 2009b). In the Northern Rocky Mountains, Canada lynx selected home ranges at mid elevations (4,702 ft. to 6,595) with high canopy closure and little open grassland vegetation (Squires et al. 2013).

Daily movements of lynx within their home range are centered on continuous forest and they frequently use ridges, saddles, and riparian areas. They avoid large openings (Squires et al. 2010), either natural or created when moving through their home range. Average daily movements for lynx in Montana were 4.2 miles per day (Squires et al. 2013), with shorter distances moved during the period from parturition until kittens were 2 months old (Olson et al. 2011). Lynx are highly mobile and capable of dispersing long distances (USDI Fish and Wildlife Service 2003b and 2007b), with dispersal distances of up to 620 miles having been recorded. Movement corridors also vary seasonally, with winter corridors providing for local connectivity of neighboring breeding populations, whereas summer corridors may facilitate long-distance dispersal such as from the range core to periphery (Squires et al. 2013).

Snowshoe hares are the primary prey of lynx in Montana (Squires et al 2006) and throughout their range (Mowat et al. 2000). Red squirrels have been reported to be the second most important food source, although in Montana red squirrel abundance was not a factor in lynx habitat selection (Squires et al. 2006). Squires et al. (2006) concluded that lynx foraging and habitat selection was strongly driven by the abundance of snowshoe hares.

Lynx typically inhabit gentle, rolling topography. Across its range, dense horizontal cover, persistent snow, and moderate to high snowshoe hare densities are common attributes of lynx habitat (Squires et al. 2013). Lynx are adapted for hunting snowshoe hares and surviving in areas that have cold winters and deep, fluffy snow for extended periods. These adaptations provide lynx a competitive advantage over potential competitors such as bobcats (*Lynx rufus*) and coyotes (*Canis latrans*) (Ruediger et al. 2000, Ruggiero et al. 1999, USDI Fish and Wildlife Service 2007b). Because of the patchiness and temporal nature of high quality snowshoe hare habitat, lynx populations require large boreal forest landscapes to ensure that sufficient high-quality snowshoe hare habitat is available at any point in time so that lynx may move freely among patches of suitable habitat and among subpopulations of lynx (USDI Fish and Wildlife Service 2009a).

Lynx den sites are located where coarse woody debris, such as downed logs and windfalls, provides security and thermal cover for lynx kittens and the amount of structure (e.g., downed, large woody debris) appears to be more important than the age of the forest stand for lynx habitat (USDI Fish and Wildlife Service 2006). Denning habitat may be located in older regenerating stands or in mature forest where downed woody debris is available. During the winter of 2011/2012 researchers from the rocky Mountain Research Station captured and collared a female lynx denning within the 1988 Canyon creek burn area (Squires 2012). Since no trees were removed and allowed to fall naturally this area supports a high degree of structure and stand regeneration supports a healthy snowshoe hare population. Denning habitat in or near foraging habitat is likely to be most functional and selected by females and multiple nursery sites are often used. Downed logs and overhead cover throughout the home range provides security habitat when kittens are old enough to travel (USDI Fish and Wildlife Service 2007b).

Lynx productivity is highly dependent on the quantity and quality of winter snowshoe hare habitat, which is a limiting factor for lynx persistence. Winter snowshoe hare habitat may be found in dense young regenerating forests where trees protrude above the snowline and in multi-storied forests where limbs of the overstory trees and understory trees provide horizontal cover. Based on research of the Rocky Mountain Research Station in Montana, in winter, lynx preferentially forage in spruce-fir forests with high horizontal cover, abundant snowshoe hares, deep snow conditions and large diameter trees (Squires et al. 2006). During summer, lynx broadened their resource use to select younger forests with high horizontal cover, abundant shrubs, and small diameter trees and dense saplings (Squires et al. 2010). Given that lynx in Montana exhibit seasonal differences in resource selection, Squires et al. (2010) recommend that managers maintain habitat mosaics. Also because winter habitat may be most limiting for lynx, mosaics should include abundant multi-story, mature spruce-fir forests with high horizontal cover that are spatially well distributed (Squires et al. 2010).

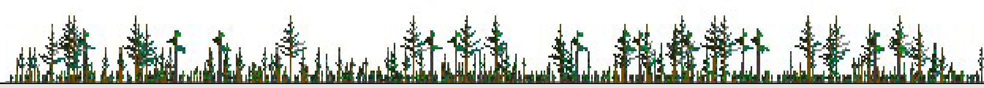
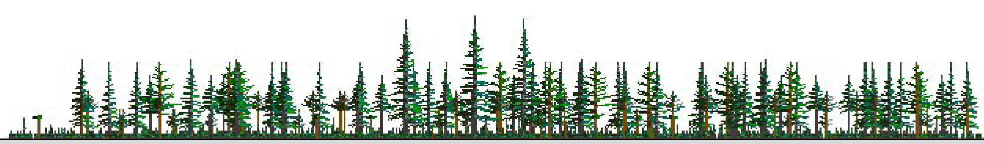
Primary mortality factors include; predation by mountain lions primarily in the spring and fall (31 percent), starvation primarily in winter (29 percent), unknown factors (22 percent) and trapping/shooting (18 percent) (USDA Forest Service 2007b).

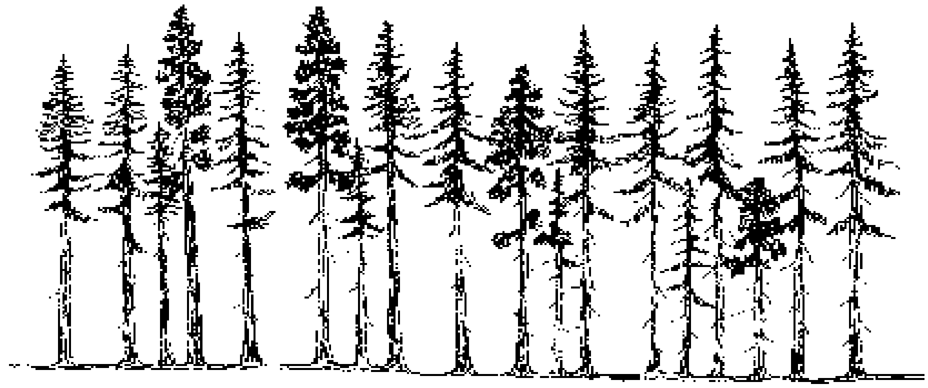
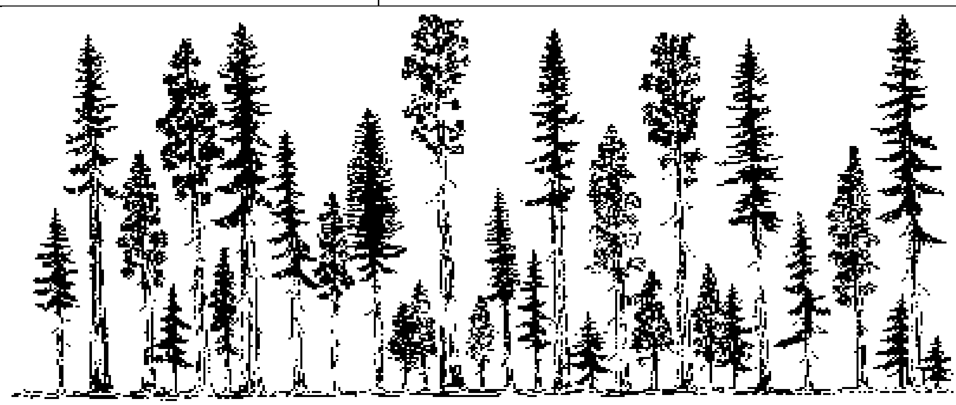
Suitable lynx habitat varies greatly depending on the vegetation structure on a site and the amount of cover and forage (i.e., snowshoe hare habitat) provided. The following is a description of the five structural stages for lynx habitat (from youngest to oldest) considered in this analysis and displayed in Figure 68 and summarized in Table 70. Lynx denning habitat conditions could potentially be found in any of the five age groups listed below, depending upon the availability of large coarse woody debris (sometimes provided in younger timber stands by residual material left over from the previous stand). A generalized graphic representation of each of these structural stages is provided in figure 68 below.These are collectively referred to as mapped habitat throughout the analysis.

1. <u>Stand initiation unsuitable</u> - Represents young (less than 15 years old) stands that are regenerating after stand replacing fire, regeneration harves or other disturbance event.The young trees are all about the same age and size and generally do not protrude above the snow, which is the reason this structural stage does not yet provide winter snowshoe hare habitat.
2. <u>Stand initiation</u> - Represents older (15-40 years old) regenerating timber stands dominated by taller saplings and small pole-sized trees. Tree sizes are more variable, with most trees protruding above the snow, providing winter forage and cover for snowshoe hares.
3. <u>Stem Exclusion</u> - Represents relatively even-aged timber stands with high stem densities and closed canopies that have grown out of reach of snowshoe hares. Competition for sunlight and moisture precludes understory development. These stands do not provide snowshoe hare habitat.

4. Mid-seral - Represents the successional stage of the stand at more of a midpoint as it moves from stand initiation toward maturity. These stands have greater variability of stand conditions than those at the stand initiation or stem exclusion phases of development. Stands may be single story or support more than one age class but understory regeneration is generally not yet dense enough to provide winter snowshoe hare habitat. Developmental stages included in this habitat classification range from young multistoried stands to single storied mature stands with little or no understory development.

5. Multi-storied -Represents stands of varying ages with three or more canopy layers. The young multi-storied stands generally do not provide winter snowshoe hare habitat because only limited understory development is within reach of hares. Mature and older multistoried stands do provide snowshoe hare habitat once the understory is dense enough to provide cover and forage, and is within reach of hares.

Structural Stage/Habitat	Description	Contribution to Lynx Habitat
Statnd Initiation. Unsuitable	After a stand-replacing fire or regeneration harvest, new seedlings establish and develop a single-story layer of shrubs, tree seedlings and saplings. Not considered winter snowshoe hare habitat because trees are too short to be available above the snow level.	Considered unsuitable for the first 15 after a disturbance because the trees and shrubs are not tall enough to protrude above the snow to provide year-round habitat. May provide denning habitat if residual coarse woody debris is available.
		
Stand Initiation	Becomes winter snowshoe hare habitat after about 15 years as young trees protrude above the snow and provide cover.	Provides winter foraging and den habitat if residual coarse woody debris is available.
		
Stem Exclusion	Single storied stand with limited understory because little light reaches the forest floor. Little dead and down material is being developed.	Not winter snowshoe hare habitat. Generally not den habitat unless residual coarse woody debris is available

Structural Stage/Habitat	Description	Contribution to Lynx Habitat
		
Mid-seral	Tree crowns too high to provide snowshoe hare cover. Limited dead and down material is being developed.	Generally not winter snowshoe hare habitat because only a limited understory developed within the reach of snowshoe hares. Denning habitat if there are piles of coarse woody debris.
		
Multi-storied Habitat Understory Re-initiation	As the forest ages, some overstory trees begin to die or are removed, making openings where a new generation of understory trees can grow in a multi-storied condition.	Winter snowshoe hare habitat if the understory is dense enough to provide cover and forage, and is within reach of hares. Denning habitat if there are piles of coarse woody material.
		

Structural Stage/Habitat	Description	Contribution to Lynx Habitat
	Some old forests develop a multi-storied structure with an understory.	Winter snowshoe hare habitat if understory is dense enough to provide cover and forage, and is within reach of hares. Denning habitat because it generally provides plenty of large coarse woody debris.
Multi-storied Habitat Old Multi-storied		

Figure 68. Description of different structural stages and their contribution to lynx forage and den habitat conditions[26]

Lynx Habitat within the Project Area

The project area is within identified lynx core habitat (USDI Fish and Wildlife Service 2005); is considered occupied (USDA Forest Service and USDI Fish and Wildlife Service 2006) and is located within designated Canada lynx critical habitat (USDI Fish and Wildlife Service 2009a, 2014).

The project area includes two LAUs: BL-07 in the west and BL-08 in the east. The land ownership, total available lynx habitat, and current road density of each LAU are displayed in table 69 whereas the current structural condition of mapped lynx habitat is summarized by LAU in table 70 and displayed in figure 69. Northern Rocky Mountain Lynx Management direction applies to mapped lynx habitat within LAUs in occupied areas, whereas critical habitat applies to all NFS lands.

[26] Taken with some modification from figure 3-2, Northern Rockies Lynx Management Direction, FEIS, volume 1, pages 146−147

Table 69. Ownership and mapped Lynx habitat by LAU

LAU	Ownership				Total LAU Acres	Mapped Lynx Habitat in LAU		General Landscape Patterns
	PVT		NFS					
	Ac	%	Ac	%		Ac	%	
BL-07	478	2	26,184	98	26,662	17,632	66	Large blocks of connected suitable hare habitat throughout the LAU. Road Density 2.8 mi/mi^2.
BL-08	197	1	27,352	99	27,549	21,421	78	Unsuitable winter hare habitat in the north and east due to recent wildfires. Large blocks of well-connected suitable hare habitat in the south and west. Road Density 1.9 mi/mi^2.

Table 70. Mapped lynx habitat – structural stage by LAU

Lynx Habitat – Structural Stage	Lynx Analysis Units			
	BL-7		BL-8	
	Acres	Percent of lynx habitat	Acres	Percent of lynx habitat
Stand Initiation Unsuitable	331	2	7,864	37
Stand Initiation	1,312	7	659	3
Mid-seral	7,431	42	9,015	42
Stem Exclusion	156	<1	373	2
Multi-storied	8,402	48	3,511	16
Total Mapped Lynx Habitat	**17,632**	**100**	**21,422**	**100**

While mapped lynx habitat is abundant within both LAUs, available winter foraging habitat (stand initiation and multi-storied structural stages) varies. For example, BL-08 provides more total lynx habitat than BL-07, it provides less habitat that is considered currently suitable primarily due to the Snow-Talon fire of 2003 which burned over 34,000 acres. Currently, available winter foraging habitat in BL-08 is widely scattered within the LAU. Conversely, BL-07 contains less total lynx habitat; however, BL-07 contains a larger amount of stand initiation hare habitat, as well as over twice the amount of multi-stored forging habitat providing more winter foraging habitat, which is better connected and interspersed throughout the LAU (figure 69).

Due to recent MPB mortality, levels of down woody debris and available denning habitat have increased within both LAUs. While more concentrated mortality generally occurs in the southern portion of the project area, as described under the dead wood section of this analysis, coarse woody debris has increased across the landscape.

In addition to the project area's designation as occupied lynx habitat discussed previously, the two LAUs in the project area (BL-7 and BL-8, table 70) are located within the broad area delineated by Squires et al. (2013) as occupied lynx habitat within the Northern Rocky Mountains. Year-round use of the affected LAUs by lynx is documented (Heritage Data 2012), but data regarding lynx use specifically within proposed treatment units is lacking. Squires et al. (2013) modeled potential movement corridors running through and beyond the affected LAUs, highlighting how these two LAUS are connected to the surrounding landscape. Annual winter track surveys south of the project area conducted by Wild Things Unlimited since 2009 and Southwest Crown Carnivore survey crews since 2012, have documented winter lynx use in both stand initiation habitat and multi-story habitat. For all these reasons, it is assumed for purposes of this analysis that lynx are likely to be present in the project area.

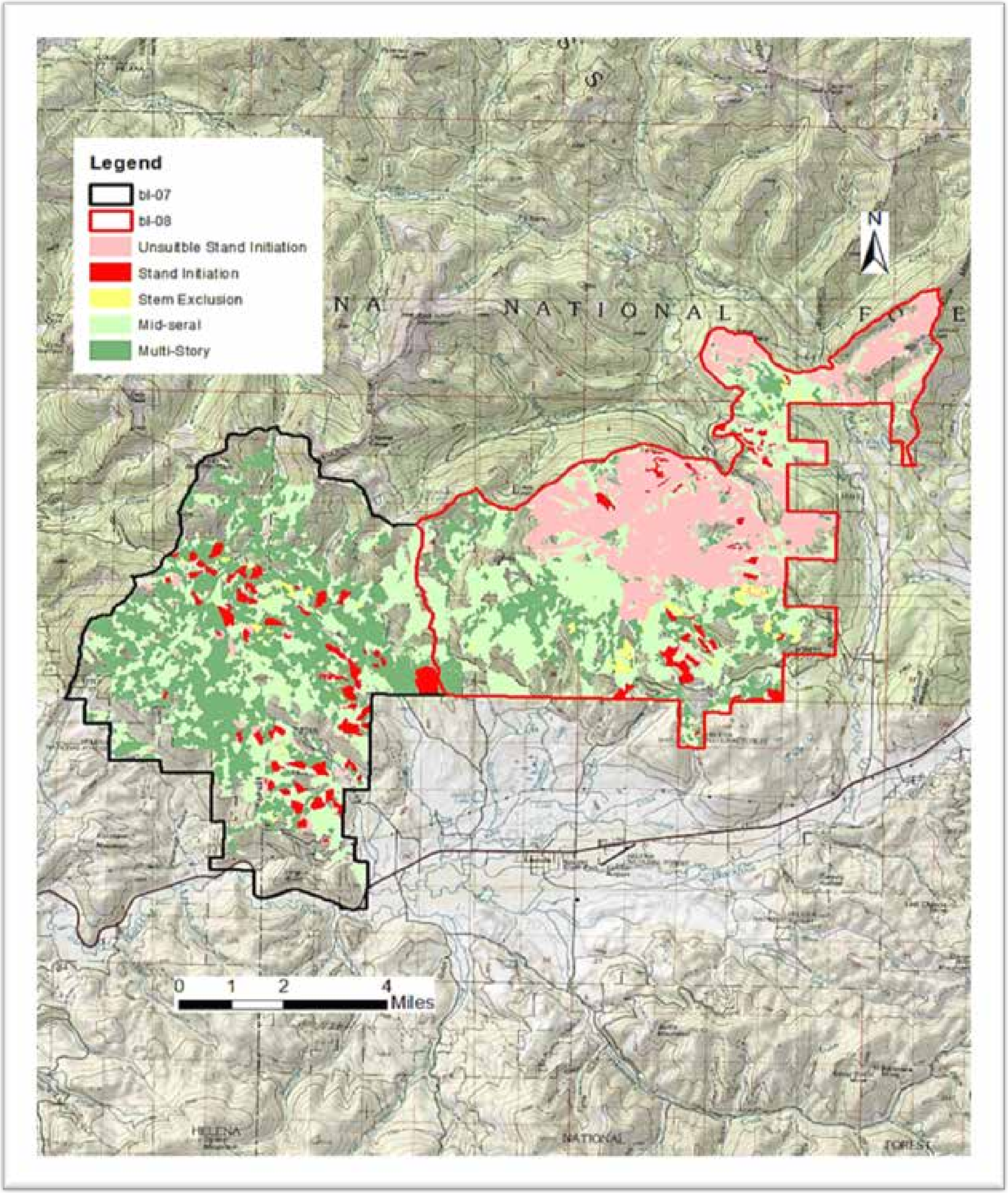


Figure 69. Existing lynx habitat by LAU

Wildland Urban Interface (WUI)

In response to direction provided by the Healthy Forest Restoration Act (HFRA 2003), the Tri-County Fire Working Group developed the 2010 Regional Community Wildfire Protection Plan (CWPP).This plan identified the WUI as the area within 4 miles of at risk urban interface. The CWPP assigned the following wildfire risk categories for lands within the WUI: very high risk for lands within 1 mile of the urban interface; high risk for lands in the 1-2-mile zone; moderate risk for lands in the 2-3-mile zone and; low risk for lands in the 3-4-mile zone. Lands beyond 4 miles are outside the WUI. For the purpose of this analysis, lands with a high or very high risk are sometimes referred to as the 2-mile zone. The NRLMD exempts certain vegetation management treatments within the WUI from the prescribed standards to allow for community protection fuel treatments. These exemptions are discussed further under Environmental Consequences section. Approximately 43 percent of BL-07 and 59 percent of BL-08 falls within the tri-county WUI displayed in figure 70.

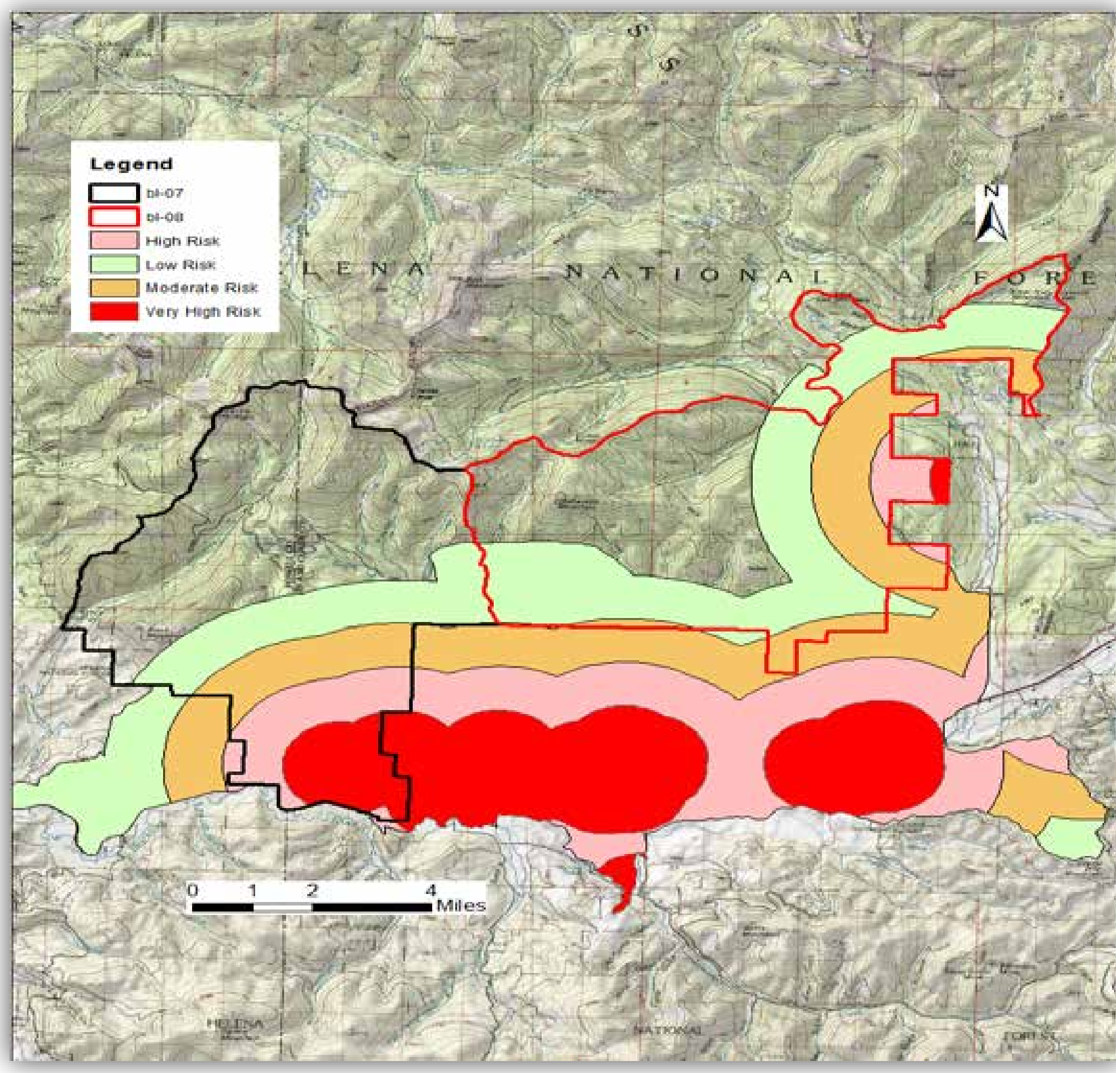


Figure 70. Stonewall Project Lynx LAUs – Tri-County WUI

Grizzly Bear

Methodology and Process

The Stonewall Project area occurs within the Northern Continental Divide Grizzly Bear Ecosystem (NCDE) grizzly recovery area. All National Forest System lands north of Highway 200 are addressed as being within the recovery zone, although approximately 500 acres within the project area are outside the designated recovery zone boundary. In addition to the Grizzly Bear Recovery Plan (USDI Fish and Wildlife Service 1993), the Helena National Forest, Forest Plan, Appendix D, provides guidelines for conservation of grizzly bear habitat within occupied habitat. Since all NFS land north of Highway 200 are addressed as being within the recovery zone, Forest Plan direction for occupied lands is also applied to all lands north of Highway 200. Addressing all lands north of Highway 200 as within the recovery zone, and as Forest Plan occupied habitat, is consistent with future management area designations of the Draft NCDE Grizzly Bear Conservation Strategy that proposes to include all lands north of Highway 200 as the Primary Conservation Area. Forest Plan direction for occupied and/or recovery zone lands is summarized below.

Forest Plan Direction and Access Management

The Helena Forest Plan (1986) provides direction and guidelines for the management and conservation of grizzly bear habitat. This direction is described in the Forestwide Goals (FP-II/1), Forestwide Objectives (FP II/4), Forestwide Standards (FP II/17, 19), Individual Management Area direction (FP III/56, 59, 60), Forest Plan Monitoring Requirements (FP IV/8) Forest Plan, Appendix A (Resolution of Issues and Concerns) and Appendix D (Guidelines for Management of Grizzly Bear Habitat).

For NFS lands within the recovery zone access management is addressed in accordance with the North Continental Divide Ecosystem Grizzly Bear Access Management Protocol and the Flathead NF Amendment 19 (the accepted Motorized Access Density Analysis & Security Core Area Analysis for Grizzly Bear within the NCDE). The moving windows analysis, which measures the exact density of roads, is used to identify the amount of secure habitat within the respective subunits of a Bear Management Unit (BMU) based on: (1) Total Motorized Road Density (TMRD), (2) Open Motorized Road Density (OMRD) and (3) Security Core habitat (CORE). Each BMU and subunit is evaluated against these three criteria to determine if they meet the guidelines or are in a degraded condition (do not meet guidelines).

Relevant Forest Plan direction for T&E species (II/19) specific to grizzly bear management on the HNF includes:

- In occupied grizzly habitat, to minimize man-caused mortality the open road density will not exceed the 1980 density of 0.55 miles per square mile, which was determined to have little effect on habitat capability.
- Apply the guidelines in Appendix D to the Management Situation 1 and 2 (referred to as essential and occupied prior to 1984) grizzly bear habitat on the Forest.

Appendix D of the Helena FP (1986) identifies NFS lands within the recovery zone as either Management Situation (MS) 1 or MS 2 in accordance with the Interagency Grizzly Bear Management Guidelines (IGBC 1986). No Management Situation designations were made for NFS lands outside the recovery zone. Only MS 1 and MS 2 lands are identified in Appendix D of the Helena Forest Plan. Management Situation 1 lands include the Scapegoat Wilderness, Alice Creek non-motorized area, and the upper reaches of the drainages encompassing headwaters of the Copper creek drainage. The remaining lands within the recovery zone and an area of land outside the recovery zone south of Rogers Pass along the continental divide are classified as MS 2 lands (see GB Occupied and MS map). The following is a description of MS 1 and 2 lands:

- Management Situation 1 – This area contains grizzly population centers and habitat components needed for survival and recovery of the species. Grizzly habitat maintenance and improvement, and grizzly and human conflict minimization will receive the highest priority and management decisions will favor the needs of the grizzly bear over other land uses (USDA Forest Service 1986). The probability is very great that major federal activities or programs may affect the grizzly.
- Management Situation 2 – The area lacks distinct grizzly population centers. Highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. Habitat maintenance and improvement, and grizzly and human conflict minimization may be, in some cases, important but not the most important management considerations. The effects of major federal activities or programs on the conservation and recovery of the species are not generally predictable.

In addition to the above management situations descriptions, the Helena National Forest uses the following information for managing grizzly habitat:

- Coordination dates for grizzly habitat use are:
    - Spring habitat (concentrated use areas) – April 1 to June 30
    - Breeding areas (May 1 to July 15).
    - Alpine feeding areas (July 1 to September 15.
    - Subalpine fir/whitebark pine habitats (August 1 to November 30).
    - Denning habitat – October 15 to March 31.
- Maintain existing seasonal grizzly habitat use in constituent elements and habitat components.
- Coordinate man's activities using the measures listed or discussed in "Rocky Mountain Front Grizzly Bear Monitoring and Investigation" (Aune et al. 1984) as appropriate to the habitats and grizzly use on the Helena National Forest.

More recently, the NCDE Access Technical Group (unpublished report 2002) suggested that "grizzly bear access management apply during the non-denning period, and include April 1 through November 30 of each year." In turn, the dates of March 31 for the end of the denning period and April 1 for the start of the spring season were discussed and agreed upon (for consistency among Montana National Forests) by an interagency team of U.S. Forest Service and U.S. Fish and Wildlife Service biologists (the "Montana Level 1 Biologist Team, unpublished notes, 12/9/2003). The chronology of these dates is consistent with the best available scientific information such as the work of Mace and Waller (1997) and other grizzly bear denning studies. Therefore, 12/1 to 3/31 is used to define the grizzly bear denning period for project analysis.

Collectively, the Forest Plan guidelines, NCDE Access Management Guidelines, habitat recommendations, coordination dates, seasonal use considerations and human activity guidelines are used to maintain grizzly bear habitat and reduce impacts to bears.

In addition, the Forest Plan identifies forestwide standards that directly or indirectly benefit grizzly bears and help to minimize effects of roads on grizzly bears across the Helena National Forest. Standards that are directed at maintaining or improving seasonal habitat or security areas for big game species (for example, elk) would indirectly benefit grizzly bears and black bears by improving security and potentially improving the forage base.

Draft NCDE Grizzly Bear Conservation Strategy

The NCDE Grizzly Bear Conservation Strategy, currently in draft form, will provide future management direction for the NCDE population of grizzly bears when the population is delisted. Once the Conservation Strategy is finalized the Forest Plans for those forests in the NCDE will be amended to incorporate management direction of the Conservation Strategy. Under the Conservation Strategy, the NCDE grizzly bear population and its habitat will be managed using an approach that identifies a Primary Conservation Area (PCA) and three additional management zones (Zone 1, Zone 2, and Zone 3). The PCA is the area currently known as the NCDE Grizzly Bear Recovery Zone where the most conservative habitat protections would remain. The remaining National Forest System lands south of Highway 200 are anticipated to be classified as Zone 1 lands. The CS would set an objective of maintaining a recovered grizzly bear population in the NCDE area sufficient to maintain a healthy grizzly bear population in biologically suitable habitats within the PCA and Zone 1. The goal for the agencies implementing the CS would be to maintain a genetically diverse NCDE grizzly bear population with at least 800 grizzly bears. This would be achieved by incorporating habitat standards and guidelines described in the CS into the respective agency management plans. Upon implementation of the CS, management using the NCDE recovery zone line and grizzly bear Management Situations as described in the Interagency Grizzly Bear Guidelines (1986) would no longer be necessary and no longer apply.

Species Status and Biology

The grizzly bear was listed as threatened throughout its range in the lower 48 states on July 28, 1975. The Grizzly Bear Recovery Plan was approved in 1982, updated in 1990 and 1992, and revised in 1993 (USDI Fish and Wildlife Service 1993). The recovery plan identified seven grizzly bear ecosystems, f ive of which are currently occupied. One of these, the Northern Continental Divide Ecosystem (NCDE) occurs in part on the Helena National Forest. The Stonewall Project area is located in the southern most extension of the NCDE grizzly bear recovery zone. The overall goal of the Grizzly Bear Recovery Plan is to remove the grizzly bear from threatened status in each of the occupied or reintroduced ecosystems in the 48 contiguous United States.

Grizzly bears are considered habitat generalists, using a broad spectrum of habitats. They are opportunistic feeders and will prey or scavenge on almost any available food; grizzly bear movements are determined largely by their search for food. For example, upon emergence from the den in the early spring, grizzlies move to lower elevations and drainage bottoms in search of plants that are greening up. Throughout the late spring and early summer they move towards higher elevations, often following the snow line as food becomes available. Spring habitat tends to be at lower elevations, therefore, increased potential exists for conflict between bears and humans in these areas. In addition to being utilized for feeding, riparian zones are also heavily used by grizzlies for travel corridors (Moss and LeFrance 1987 *in* USDA Forest Service 2005).

The relative importance of forest cover to grizzly bears has been documented in various studies. A four year sturdy in the Yellowstone ecosystem found that ninety percent of 2,261 aerial radio relocations of 46 radio-collared grizzlies were in forest cover too dense to observe the bear. This same study also noted the importance of an interspersion of open parks as feeding sites associated with cover based on the relocation distances in dense forests from openings (USDI Fish and Wildlife Service 1993). Dense forests are also important for thermal cover, hiding cover, and day beds and most beds are located within six feet of a tree (ibid.).

Grizzly bear habitat is best described in terms of the availability of large tracts of relatively undisturbed land that provides some level of security from humans (ibid.). Effective habitat is often described in terms of core habitat or areas free of motorized access during the non-denning period. Open and total road densities are also important measurements in determining core areas and understanding the extent of habitat security for bears (ibid.).

The Grizzly Bear Recovery Plan (ibid.) indicates the most important element in grizzly bear recovery is securing adequate effective habitat. This is a reflection of an area's ability to support grizzly bears based on the quality of the habitat and the type/amount of human disturbance in the area. Controlling and directing motorized access is one of the most important tools in achieving habitat effectiveness and managing grizzly bear recovery (ibid.).

Analysis Area

Grizzly bears are the largest, most wide-ranging forest carnivore in western Montana. The needs of grizzly bears are met at the Forest level and through management and maintenance of Bear Management Units (BMUs), which help ensure the conservation of this species. The Stonewall Project area is included within the Monture-Landers Fork Bear Management Unit and includes portions of the Arrastra and Red Mountain sub-units.

The analysis for grizzly involves a multi-scale assessment. Direct and indirect effects are evaluated across the 24,000-acre project area, and by subunit, which are meant to approximate the home range of a female grizzly bear. This area was selected because it includes all treatment units as well as adjacent habitat that might affect use of the area by bear. Cumulative effects are evaluated across a larger area that includes: the Arrastra and Red Mountain sub-units, and lands outside the recovery area that are utilized by bear to access the Blackfoot River and lands to the south.

Grizzly Bear Habitat

The Helena National Forest manages more than 76 percent of the land within the Arrastra Mountain and Red Mountain subunits. Table 71 summarizes the status of these lands within the project and cumulative effect areas. The recovery zone occupies 91 percent of the cumulative effects area and 97 percent of the project area. Lands outside the recovery zone include those that connect the project area with the Blackfoot River to the south, as well as private lands within each sub-unit. Management Situation 1 lands include high- quality habitat that adjoins the Scapegoat Wilderness, which occurs on approximately 10 percent of the project area recovery zone, whereas over 85 percent of the project area occurs as Management Situation 2 lands.

Table 71. Project area bear management situation lands

Grizzly Bear Habitat Status	Project Area (24,005 ac)		Cumulative Effect Area (89, 216 ac)	
	Acres	%	Acres	%
Arrastra Mountain Sub-unit	17,616	73[2]	36,931	41
· Management Situation 1	2,264	9	3,187	4
· Management Situation 2	15,101	63	29,361	33
· Lands not Designated (private)	251	1	4,383	4
Red Mountain Sub-unit	5,833	24[2]	44,571	50
· Management Situation 1	14	<1	6,854	8
· Management Situation 2	5,819	24	25,618	28
· Lands not Designated (private)	0	0	12,099	14
Occupied Lands Outside Recovery Zone[1]	506	2	7,714	9

1 - % of project and cumulative effect area

2 - % of project area BMU

Den Habitat

Three primary studies on grizzly den site selection, entrance, and emergence periods have been conducted in the NCDE. These studies also incorporated and/or compared findings with other available North American grizzly bear and brown bear denning information gathered previously. Within the NCDE, Servheen (1981) studied denning in the Mission and Rattlesnake Mountains, Aune and Kasworm (1989) studied denning along the Rocky Mountain Front, and Mace and Waller (1997) studied denning in the Swan Mountains. These three studies provide the baseline for the grizzly bear denning analysis for this project.

Parameters selected to model grizzly bear denning habitat were based on the three studies noted above, literature reviews, and discussions with other wildlife biologists. These parameters are consistent with research findings and other denning habitat mapping efforts within the NCDE. The selected parameters represent the elevational band of habitat most commonly used by denning grizzly bears; higher elevation slopes sufficiently steep and shaded to retain snow throughout the denning season with soil types conducive to den excavation and den structural integrity. The parameters for modeled denning habitat are displayed in table 72 below.

Table 72. Grizzly bear denning habitat parameters for Blackfoot landscape

Habitat Type	Elevation (ft)	Slope (%)	Cover	Aspect (Cardinal)
High Potential	>6,200	>35 and <100	All types except rock	N, NE, and NW
Potential	>6,200	>35 and <100	All types except rock	All other aspects

High potential denning habitat selects for all north aspects while potential denning habitat selects for all other aspects. Various bear denning studies found that when available northerly aspects are most often selected for den sites. North aspects provide the most shading and retain snow longer providing the most consistent micro-climate during hibernation. Acres of high potential and potential denning habitat and the percentage of available denning habitat within the respective subunits are shown in table 73 below.

Table 73. Grizzly bear denning habitat by subunit

Subunit	Subunit Acres	Denning Habitat	Denning Habitat by Subunit		Denning Habitat Distribution %	
			acres	%	Project Area	Wilderness
Arrastra Mountain	69,316	High Potential	7,358	11	22	78
		Potential	16,023	23	31	69
		Total	**23,381**	**34**	**28**	**72**
Red Mountain	76,735	High Potential	7,451	10	27	73
		Potential	11,211	15	32	68
		Total	**18,662**	**24**	**30**	**70**
Combined Subunits	146,051	High Potential	14,809	10	24	76
		Potential	27,234	19	31	69
		Total	**42,043**	**29**	**29**	**71**

Grizzly bear denning habitat occurs at upper elevations scattered across the project area. Collectively, high potential den habitat represents approximately 10 percent of the combined subunits, whereas potential den habitat represents approximately 19 percent of the combined subunits. For both the Arrastra and Red Mountain subunits, the majority of denning habitat occurs in the Scapegoat Wilderness. As noted previously, 12/1 through 3/31 is the accepted timeframe for the grizzly bear denning period in the NCDE.

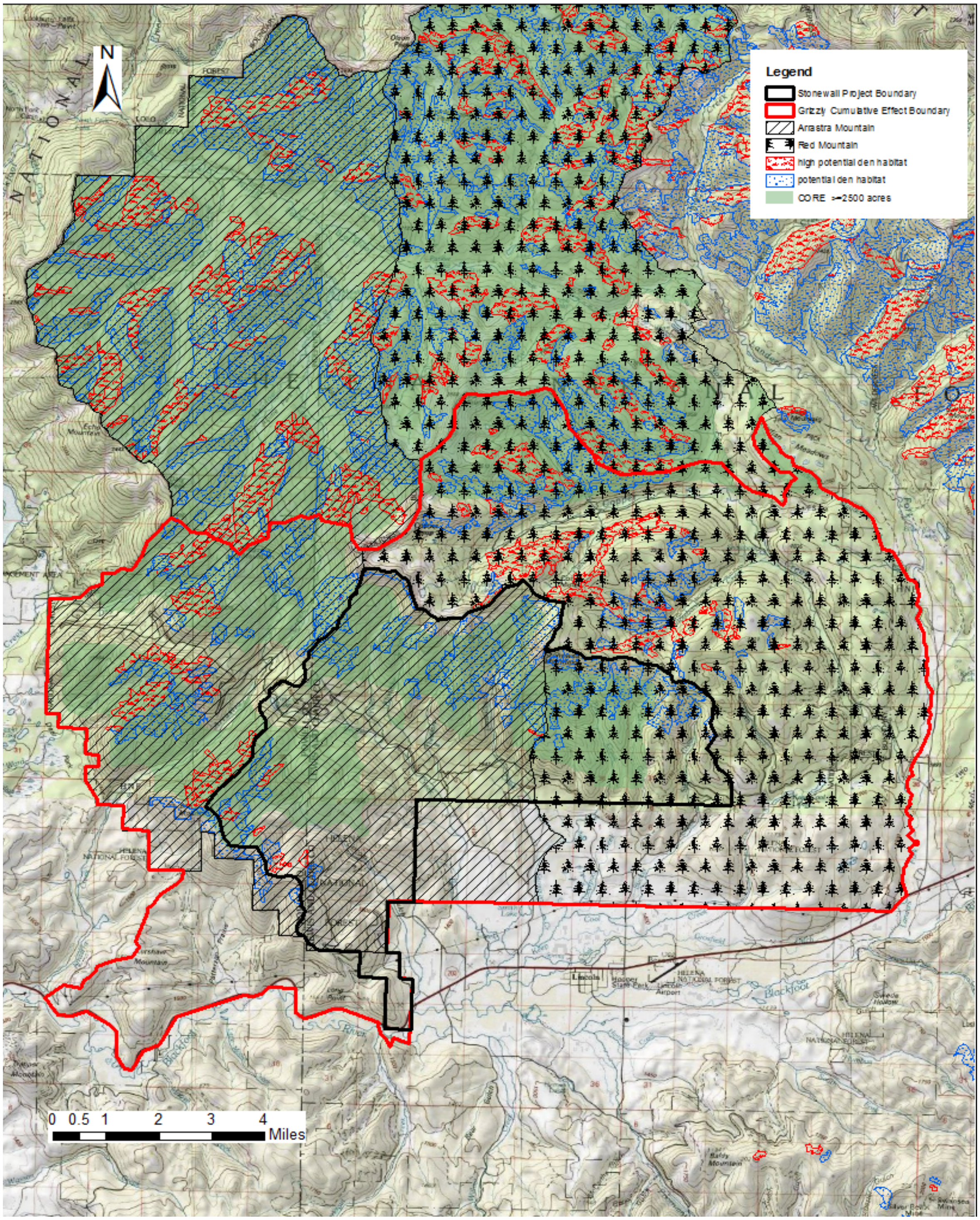


Figure 71. Grizzly bear den and core habitat

Motorized Access Management

Within the Landers Fork BMU, road densities are managed in accordance with the Flathead National Forest Amendment 19, which considers parameters of open motorized route density (OMRD), total motorized route density (TMRD) and secure core habitat (CORE). These measures, referred to as the 19/19/68 guidelines, are collectively used to conserve grizzly bears within the NCDE recovery zone and apply to the non-denning period only (4/1 – 11/30).

Open motorized route density includes roads and trails that are open to wheeled motorized use during any portion of the non-denning period. Total motorized route density includes roads and trails open to wheeled motorized use and those with temporary restrictions, such as gates. Open motorized route density is reported as the percentage of each BMU subunit that has more than 1 mi/sq mi of open routes, and TMRD is reported as the percentage of each BMU subunit that has more than 2 mi/sq mi of total routes. Secure core habitat is defined as those areas more than 0.3 miles from a motorized access route during the non-denning period, and at least 2,500 acres in size. Secure core habitat is expressed as the percentage of the BMU subunit that meets this definition. Table 74 summarizes existing TMRD, OMRD and CORE for the Arrastra and Red Mountain sub-units. Table 74 reflects the moving windows values both with and without late season snowmobile use (i.e. authorized snowmobile use after 3/31).

Table 74. Existing OMRD, TMRD, and CORE habitat

Subunit	Percent of subunit meeting 19/19/68 guidelines								
	Alt 1			With Late Season Snowmobile Use			Without Late Season Snowmobile Use		
	Total Subunit Acres	Total NFS Acres	Percent NFS lands	OMRD	TMRD	CORE	OMRD	TMRD	CORE
Arrastra Creek	69,316	64,936	94%	19	21	72	17	19	74
Red Mountain	76,735	64,606	84%	26	25	56	24	21	58

OMRD - Open motorized route density guideline: ≤19% of each subunit with >1.0 mile/mi2

TMRD - Total motorized route density guideline: ≤19% of each subunit with > 2.0 mile/mi2;

CORE - Greater than 2500 contiguous acres, >=0.3 mi. from motorized route, no roads or trails receive high intensity use and no motorized routes open during non-denning period) guideline: ≥68% of the subunit considered core area

As shown above the Arrastra Mountain subunit currently the meets the 19/19/68 guidelines for OMRD and CORE with or without late season snowmobile use. The subunit does not meet the TMRD guideline when late season snowmobile use is included but does meet it when not included. The Red Mountain subunit currently does not meet any of the 19/19/68 guidelines with or without late season snowmobile use

Approximately 45 percent of project area habitat within each sub-unit occurs as core habitat and these lands connect to larger blocks to the north (see figure 71). Also approximately 64 percent of the modeled den habitat within the project area occurs within core habitat.

Project Area Use

While denning activity within the project area has not been documented, resident bears are known to occur within the project area during the non-denning period. Bears have been observed moving through the area after emerging from hibernation to reach lower elevation spring habitats and other habitats throughout the summer and fall. Generally bears utilize lower elevations in the project area after emerging from hibernation to forage on herbaceous vegetation in the spring and move to upper elevations following snowmelt. Foraging and use of upper elevation sub-alpine habitat, as well as forested stands containing berry producing shrubs occurs later in the summer and fall. Lands at the southern extent of the project area and to the southwest are particularly important for bears accessing the Blackfoot River corridor. Grizzly bears utilize the Blackfoot River extensively for foraging and seasonal movements, and are known to move through the southern portion of the project area to access the river corridor. Action area lands also provide connectivity for bear movements between the Scapegoat Wilderness and lands south of Highway 200.

Sensitive and Federal Candidate Species

North American Wolverine

Methodology and Process

Data for wolverine occurrence within the project area are derived from the Montana Natural Heritage Program (Montana NHP 2011), from snow-tracking surveys (Wild Things Unlimited 2011) conducted annually since winter 2009/2010, and from Southwest Crown Forest Carnivore Surveys conducted since winter 2011/2012. Wolverine habitat was modeled on late season snow persistence (Copeland et al 2009) and wolverine maternal habitat (Inman et al 2013).

In general, wolverine habitat requirements include, but are not limited to, large areas of unroaded security habitat, secure denning habitat and available ungulate carrion in winter. Existing habitat conditions and potential effects to wolverine were evaluated by looking at the availability of remote habitat, potential effects to suitable den habitat, and changes in human access and ungulate availability.

Wolverines range widely across the landscape in search of suitable habitat and prey. Given their propensity to travel long distances, direct, indirect and cumulative effects are analyzed across the combined boundary, which totals 101,977 acres. This area was selected because it is large enough to assess home range considerations, and evaluate landscape-level effects. It includes preferred remote habitat, lands with persistent snow preferred for denning and dispersal, and lands affected by recent wildfires.

Species Status and Biology

The wolverine is classified as a Sensitive Species by the Regional Forester, Northern Region. At the present time (November 2014), the USFWS is under litigation regarding their August 2014 decision to withdraw their February 2013 proposal to list the North American wolverine Distinct Population Segment (DPS) as a Threatened species. Therefore, the legal status of the wolverine is subject to change before the analysis contained in this report is incorporated into the final NEPA documentation and decision for the Stonewall Vegetation Management Project.

To accommodate and anticipate any potential change in status, this report assesses potential effects of the Stonewall Vegetation Management Project alternatives on the North American wolverine, and presents concluding information based on three possible scenarios:

1. The current litigation is either not resolved at the time the NEPA analysis is released, or the court has upheld the USFWS decision not to list the wolverine under ESA. Under these circumstances, the wolverine would remain as a Regional Forester Sensitive Species.
2. The court has instructed the USFWS to further evaluate their decision not to list the wolverine under ESA and the species is returned to Proposed status until that determination is completed.

3. The USFWS is ordered by the court to list the wolverine as a Threatened species.

Wolverine is a solitary and highly mobile species that tends to inhabit remote areas and occurs at relatively low densities (Banci 1994). Wolverines range widely from subalpine talus slopes to big game winter ranges, occupying higher ranges in the summer and riparian habitats in the spring. Ruggiero et al (1999) found that wolverines used higher elevations in the snow-free season to avoid high temperatures and human activity. In the northern Rocky Mountains, wolverines make extensive use of coniferous forest (Hornocker and Hash 1981). While wolverines are generally regarded as wilderness animals, they may include clear-cut areas in their home ranges (Hornocker and Hash, 1981) and are reported to scavenge around northern Canadian communities (Banci 1994). Wolverines exhibit some fidelity to particular areas for months or years, however, the species is thought to have a flexible behavioral system under changing environmental conditions (e.g., food supply), that supersedes boundary considerations (Hatler 1989).

Wolverines are opportunistic feeders and consume a variety of foods depending on availability. They primarily scavenge carrion, but also prey on small mammals and birds, and eat fruits, berries and insects (USDI Fish and Wildlife Service 2010). In both Montana and Idaho, big game carrion appears to be the major food source with snowshoe hare, squirrels, and small mammals making up the rest of their diet (Hornocker and Hash 1981). Large mammal carrion is an important dietary component, particularly in winter when other prey is scarce (Banci 1994, Pasitschniak and Lariviere 1995) and they rely heavily on the presence of other predators. Wolverines will also search for caches made by itself, other wolverines, or other carnivores during the winter.

Female wolverines use two kinds of dens for reproduction. They use natal (birthing) dens to give birth and raise kits early postpartum, prior to weaning. These are excavated in snow and persistent, stable snow greater than 5 feet in depth appears to be a requirement because it provides security for offspring and buffers cold winter temperatures (USDI Fish and Wildlife Service 2013). In Montana, natal dens occur above 7,874 feet and are located on north aspects in avalanche debris typically in alpine habitats near timberline (USDI Fish and Wildlife Service 2013). Prior to weaning, females may move kits to one or multiple alternate den sites, referred to as maternal dens. The movement of kits from natal to maternal dens may be a response by the female to den disturbance, better food availability in the new location, predation risk, or deteriorating den conditions in the natal den (Magoun and Copeland 1998).

Post-weaning dens are called rendezvous sites. These dens may be used through early July. Females leave their kits at rendezvous sites while foraging, and return periodically to provide food for the kits. These sites are characterized by natural (unexcavated) cavities formed by large boulders, downed logs (avalanche debris), and snow (Inman et al. 2007). They may also occur in talus or coniferous riparian zones.

Wolverine home ranges are generally extremely large and the availability and distribution of food is likely the primary factor in determining wolverine movements and home range. Home ranges of adult wolverines range from less than 38.5 square miles to 348 square miles (USDI Fish and Wildlife Service 2010). Home ranges of adult males and females overlap extensively with the range of one male covering the ranges of two to six females, which is considered one reproductive unit.

Wittmer et al. (1998) suggested long-term conservation of wolverine can be achieved through maintenance of large, remote areas of habitat and engaging in management activities that do not decrease ungulate prey density.

Threats

Wolverines have few natural predators although both interspecific and intraspecific mortalities have been documented. Wolverines are susceptible to mortality through hunting and trapping and human caused disturbances near den sites (Banci 1994, Hornocker and Hash 1981, Copeland 1996). The State of Montana contains most of the habitat and wolverines that exist in the current range of the DPS, and regulates trapping to reduce the impact of harvest on wolverine populations. Montana is the only state where wolverine trapping is still legal; however the wolverine trapping season is currently suspended.. Based on the best scientific and commercial information available, the USFWS concluded that that level of trapping (including incidental mortality) by itself, or even when combined with the likely effects of climate change, would not be a threat to the wolverine DPS (USDI Fish and Wildlife Service 2014).

In their proposed rule to list the wolverine as threatened (USDI Fish and Wildlife Service 2013), the USFWS concluded that the impacts of climate change constitute the primary threat to the DPS of the wolverine, and that the continued existence of the wolverine could be at risk. Other threats considered, but determined not to be threats to the wolverine DPS included (1) human use and disturbance, (2) dispersed recreational activities, (3) infrastructure development, (4) transportation corridors, and (5) land management. Little information exists regarding effects to wolverines from development or human disturbances associated with them. However, what little information does exist, suggests that wolverine can adjust to moderate habitat modification and human disturbance. The available scientific information does not indicate that potential impacts from activities such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the wolverine DPS (USDI Fish and Wildlife Service 2013). After further consideration and with input from peer review, public comments, and the expert panel workshop, the USFWS withdrew their listing proposal and presented a new conclusion that impacts from climate change also do not pose a risk of extinction to the wolverine DPS (USDI Fish and Wildlife Service 2014).

North American Wolverine Project Area Habitat and Documentation

The Stonewall Project’s combined analysis boundary is near the eastern extent of this species range in Montana (MNHP 2011). While foraging habitat is widespread in this area, denning, maternal, and dispersal habitat is restricted to more remote upper elevation lands with deep persistent snow in the northern half of the analysis area. Approximately 4,650 acres of maternal habitat and 8,560 acres of late snow persistence habitat occur within the project area. Both models reflect project area wolverine habitat as the southern extension of large block of habitat that largely occurs in the Scapegoat Wilderness to the north.

Generally, much of the southern half of the analysis area is located at lower elevations; contains less persistent snow cover; is more heavily roaded; and is characterized by year-round human presence. As a result, these lands do not provide preferred den or dispersal habitat.

The project area and combined analysis area do contain both historical and more recent documentation (Montana NHP 2013) of wolverine occurrence, although no den sites are known to occur in the area. Recent tracking surveys have also documented winter use south in the Dalton Mountain area and within lands affected by the 2003 Snow Talon Fire in the Copper Creek drainage (Wild Things Unlimited 2011 and 2012).

Since 2003, over 23,000 acres of wildfire have burned approximately 5,990 acres of maternal habitat based on the Inman et al (2013) model and 7,720 acres of habitat based on the Copeland et al (2009) late snow persistence model for years 1-7.

Gray Wolf

Methodologies and Process

Wolves are considered highly productive habitat generalists (MFWP 2011a), therefore, risks include primarily a reduction in prey (deer and elk), or mortality associated with increased human interaction and tolerance. There are no known den or rendezvous sites within the Stonewall project area, therefore, wolf habitat for this analysis is evaluated by looking at changes in primary prey species and foraging, the availability of remote and dispersal habitat and the amount of and changes in human access.

Elk are considered a primary prey species for wolves, as a result, the analysis of wolf habitat parallels that of elk. Direct and indirect effects are evaluated across the project area, whereas cumulative effects are evaluated across the combined boundary.

Species Status and Biology

The population distribution, life history, habitat status and recovery objectives for the gray wolf are summarized in the recovery plan (USDI Fish and Wildlife Service 1987). The legal status of a wolf under the ESA is tied to its location rather than its point of origin. In Montana, wolves are part of the Northern Rocky Mountain Gray Wolf Distinct population Segment (DPS) and have achieved biological recovery under ESA. Consequently on May 5, 2011, wolves that are part of the DPS segment encompassing Idaho, Montana and parts of Oregon, Washington and Utah were delisted under ESA. As a result, the gray wolf is evaluated as a Regionally Sensitive Species.

Gray wolves are the largest wild members of the dog family (*Canidae*), and typically prey on medium and large mammals. Prey species in the Rockies include white-tailed and mule deer, moose, elk, woodland caribou, bighorn sheep, mountain goat, beaver, and snowshoe hare, with small mammals, birds, and large invertebrates sometimes being taken (USDI Fish and Wildlife Service 2003a). Opportunistic feeders, they will also prey on carrion when it is available. Habitat can include forests of all types, rangelands, brush land, steppes, agricultural lands, wetlands, deserts, tundra, and barren ground areas.

The gray wolf is territorial in most areas. Territories are defended by howling, scent-marking, and physical defense against wolf interlopers. Territories typically range from 20 mi2 to 214 mi2 (Mech 1970 in Tucker 1988, Peterson 1977 in Tucker 1988). Daily pack movements vary and distances traveled are greater in winter than in summer. Lone wolves cover larger areas than packs and their use areas may overlap two or three pack territories (Mech 1973 in Tucker 1988, Fritts and Mech 1981 in Tucker 1988).

Wolves tend to be most active in the early or late evening and travel within their territories at night. Patterns of activity are influenced by weather and season of year. While wolves are generally not considered migratory, they may wander great distances daily, within their home range, predominantly influenced by searching for prey. When reproduction increases population numbers within an area, young adult wolves may disperse to new areas. Wolves may establish “runways” by following the same routes within territories. Vegetative cover affects wolf survival by providing shelter for prey species such as deer and elk, and in general, healthy wolves need little cover (Mech 1970 as cited in Tucker 1988).

Wolf dens are used for bearing and protecting pups, and are often abandoned when pups reach 2 months of age. The same den may be used year after year, or different dens may be selected. Pups are sometimes moved from one den to another. Dens may be holes dug in the ground, rock caves and crevices, old beaver lodges, and hollow logs or other ground debris. Den sites are typically located near water, dug in sandy and well-drained soils, and located in a variety of landforms (Mech 1970 as cited in Tucker 1988 and Fritts 1982 in Tucker 1988).

Wolves are highly social animals requiring large areas to roam and feed. Key components of wolf habitat include; (1) sufficient, year-round prey base of big game and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans (USDI Fish and Wildlife Service 1987).

Gray Wolf Project Area Habitat and Documentation

Wolf habitat within the project area is variable, with more marginal denning habitat occurring in much of the southern portion of the project area due to the density of roads and proximity to human activity. More remote habitat conditions preferred for denning occur in the headwaters of the Lincoln Gulch, Klondike, Yukon and Park Creek drainages.

Wolf occurrences have consistently been documented in and around the project area for several years. Most of the occurrences were believed to be those of transient individuals. In the winter of 2008/2009 a pack was verified in the Marcum Mountain area less than 10 miles from the project area. This pack was known to use the Arrastra Creek area, and suspected in the Patterson Prairie area adjacent to the project area. There have not been recent accounts of the pack however; so it is currently not known if they are still established in the area.

There are no known den or rendezvous sites within the project or combined areas, although individuals from the Arrastra and Alice Creek packs have been documented within or immediately adjacent to the combined boundary. Also the Landers Fork pack utilizes private and adjacent NFS lands to the southeast. In general, management for wolves is best achieved by maintaining adequate habitat for big game species to provide sufficient prey for wolves and by minimizing wolf/human interactions. Predation of ungulates (i.e., deer and elk) by wolves as well as other predators has been high and MFWP is proposing actions to moderate both wolf and mountain lion densities in the vicinity of the project area (Kolbe 2012).

Fisher

Methodology and Process

Fisher were initially evaluated using the habitat estimates for maintaining viable populations of the Northern Goshawk, Black-backed woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher (Samson 2006b), as described in the criteria for wildlife models, Helena National Forest (USDA Forest Service 2009a). Habitat was based on data that estimated anticipated MBP mortality and was identified as summer and winter habitat, based on canopy closure and tree size class.

Region 1 revised the fisher model in 2012 (USDA Forest Service 2012f). This effort was based on information from published scientific literature on fishers, especially studies from the Northern Rockies, and on previous habitat modeling efforts by Samson (2006a) and Hills and Lockman (2003). This model identifies two types of habitat including, (1) resting/denning/foraging habitat that includes moist, mesic forests with dense canopies in mid- to late-successional stages, providing the full suite of fisher life history needs, and (2) other foraging habitat or moist, mesic forests with dense canopies including younger successional stages providing foraging opportunities (USDA Forest Service 2012f).

Specific parameters in the revised model include; (1) potential climax vegetation preferred by fishers, (2) a minimum canopy closure of 40 percent, (3) tree size class including trees greater than 10 inches d.b.h. for resting/denning/foraging habitat and trees up to 9.9 inches d.b.h. for other foraging habitat and (4) a maximum elevation of 6,500 feet. Small isolated habitat less than 160 acres in size or greater than 600 feet from the nearest existing habitat was eliminated. Habitat estimates from the updated model identified a total of approximately 4,400 acres of widely scattered habitat across mid- to low elevations within the project area.

Both models used R1VMAP data and considered changes in habitat due to recent wildfires, The models differed somewhat in that the revised model identified some large blocks of low elevation den/rest/forging habitat in areas where there has been concentrated MPB mortality. So while the revised model (Buhl 2015) is used to identify fisher habitat, based on field observation in the project area and estimates of future mortality, it is expected that some lands currently identified as suitable fisher habitat would fall below 40 percent canopy closure in the next 5 to 10 years, making these areas marginally suitable or unsuitable.

Fisher tend to select habitat based on structural conditions, therefore, fisher habitat is also evaluated by looking at availability and changes to horizontal (landscape) and vertical (site level) structure, including downed woody debris and large snag availability. Changes to suitable riparian habitat are also assessed because of strong support in the literature for the association of fishers within riparian habitat (USDA Forest Service 2012f).

Management recommendations for fisher include; (1) conservation of 20 percent late-successional forest at low to mid-elevations, (2) maintenance of riparian corridors for use by individuals and populations, (3) maintenance of links between populations and, (4) management of trapping pressure (e.g., facilitated by road access) (Wittmer et al. 1998).

Direct and indirect effects to fisher are evaluated across the project area (24,000 acres), which is large enough to evaluate landscape-level effects at the home range scale. However, in order to evaluate landscape-level influences across all ownerships and assess impacts from recent wildfire, cumulative effects are evaluated on the combined boundary, which exceeds 100,000 acres.

Species Status and Biology

The State rank for the fisher is S3 (MFWP 2011a), and although they are a Montana State species of concern, they are also classified as a furbearer. As a result it is legally trapped under a limited quota system, allowing for take of seven individuals statewide. Presumed extirpated by the 1920s, until recently, fisher populations in Region 1 were thought to be derived from re-introductions that occurred from populations in B.C., Canada, and Minnesota in the 1960s and late 1980s (Vinkey 2003). Genetic testing of fisher in western Montana indicates that statewide individuals are part of the original population that existed prior to any reintroductions (Vinkey 2003).

The home range of fishers varies in size from 4 to 32 square miles; but the average for a female fisher is expected to be about 15 square miles (Jones et al 1991). Optimum habitat is thought to include mature, moist coniferous forest with a woody debris component, particularly in riparian/forest ecozones in low- to mid-elevation areas that do not accumulate large amounts of snow (Heinemeyer 1993; Ruggiero et al. 1994). A review of fisher research suggests the species uses a diversity of tree age and size class distributions at the patch or stand level that provides sufficient overhead cover (either tree or shrub). Banci (1989) believes the best fisher habitats are multi-aged stands interspersed with small openings containing riparian habitats. Fisher feed on snowshoe hares, porcupines, carrion, squirrels, small mammals and birds (Banci 1989; Powell and Zielinski 1994 in Ruggiero et al. 1994). This diverse diet makes them less vulnerable to shifts in prey abundance than lynx and other predators that rely heavily on one or two prey species.

Like marten, fishers avoid large openings (parks, meadows, early seral clearcuts, and burns). Also like other forest carnivores, fishers maintain relatively low population densities and range widely in search of prey and key habitat sites (structurally complex forest) (Banci 1994). Because of their aversion to openings, they seek out forested connections between the key habitats in which they focus activity (Banci 1994). These connecting habitats may consist of a variety of forest formations and seral stages and do not necessarily exhibit the complex structure and prey density of their preferred habitat sites (Heinemeyer and Jones 1994).

Fishers are strongly associated with riparian zones (Jones 1991, Heinmeyer and Jones 1994, Ruggiero et al. 1994). Jones et al. (1991) found that 80 percent of fisher relocations were within 300 feet of a riparian zone or wet area, and in Montana, fishers were found to prefer areas within 600 feet of water (Heinemeyer and Jones 1994). Many have documented that riparian corridors are used extensively as travel corridors (Heinemeyer and Jones 1994), and Jones (1991) suggests that preferred resting habitat and prey are likely more available within forested riparian areas.

Fishers appear to select structure rather than forest type—vertical and horizontal complexity, down woody debris, light gaps, and overhead cover. Fishers need structure that leads to high diversity of dense prey populations, as well as desired structure at dense and resting sites (Ruggiero et al. 1994). They also appear to be associated with areas of low snow accumulation—flat areas and bottoms—and avoid mid slopes (Ruggiero et al. 1994).

Dense coniferous and mixed coniferous/deciduous forests are preferred and this species is always found in or near forests with continuous overhead cover. Fisher prefers forests with high canopy closure (greater than 80 percent) and avoid areas with low canopy closure (less than 50 percent). Forest stands with low canopy closure were used only if they were adjacent to areas with dense cover (USDI Fish and Wildlife Service 1983). Documented den sites have occurred in cavities of live and dead trees in forested areas with some structural diversity (i.e., forb/shrub cover, down wood and multiple canopy layers) that maintain a diversity of prey species (Ruggiero et al. 1994). Young are born in early March to mid-April (NatureServe 2011).

Region 1 forests contain a total of 4,239,280 acres and 1,882,031 acres of rest/den/foraging and other foraging habitat respectively. As a result regionwide, available fisher habitat is well above any of the minimum threshold amounts reported by Smallwood (1999) or Samson (2006a) and fisher habitat is abundant to support a viable population of fishers. Of the available habitat regionwide, the Helena National Forest contains approximately 4 percent or 230,381 acres of habitat (USDA Forest Service 2012f).

Fisher Project Area Habitat and Documentation

The Stonewall Project area is near the southeastern extent of this species range in Montana. While fisher were not detected during recent (since 2004) surveys within the project area in the Beaver Creek drainage, they were recently documented in the Arrastra drainage west of the cumulative effects boundary (USDA Forest Service 2012f, MNHP 2013), as well as on lands to the south.

Alteration of forest structure due to natural or human-caused disturbances can adversely affect habitat for fisher. For example, while a pulse of logs on the ground due to fire or insect and epidemics can provide denning structures and cover, these areas would likely be avoided if the canopy cover is less than 40 percent. Because of recent MPB mortality, canopy closure and suitable fisher habitat has been reduced, particularly on low elevation lands that contain a predominance of lodgepole pine. Conversely, this mortality has increased the amount of standing dead and DWD available providing the structural conditions preferred by fisher. Using the revised Region 1 model parameters described in the methodology section, potential fisher habitat currently occurs on approximately 4,400 acres or 18 percent of the project area, which is within the historic range of variability for fisher on the Helena National Forest of 13.1 to 18.4 (Hills and Lockman 2003).

The best available science was used in identifying potential fisher habitat for this analysis, which indicates that older forests less than 6,300 feet in elevation within 300 feet of perennial riparian features provide key habitat for resting and denning (Hills and Lockman 2003). Within the project area, there are approximately 400 acres of mature, older forest within 300 feet of a stream. Connectivity of fisher habitat is variable (see figure 83). Lands in the eastern third of the project have the largest amount of and most connected riparian and upland habitat, whereas connectivity is reduced in the lower Beaver Creek and Lincoln Gulch drainages, due to the dryer site conditions and larger lodgepole pine component.

Samson (2006b) determined that approximately 74,378 acres of habitat (summer and winter) would be needed to maintain minimum viable populations of fishers in the Northern Region. Currently, based on FIA data, there are 199,905 acres of fisher habitat (summer and winter) on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Townsend’s Big-Eared Bat

Methodology and Process

Data presented on Townsend’s big-eared bat are based on available research and surveys from Montana (Hendricks and Maxell 2005; MNHP 2011; USDA Forest Service 2011c). The project area lacks suitable hibernacula, so effects to this species are evaluated by looking at the availability of, and changes to, foraging habitat. Since this species would be most affected by the structural changes from proposed treatment (i.e., understory and overstory conditions), direct, indirect and cumulative effects are evaluated across the project area. This area is also large enough to evaluate landscape-level changes in habitat.

Species Status and Biology

A year-round resident, the State rank for the Townsend’s big-eared bat is S2 (MNHP 2011). It is considered at risk because of very limited and potentially declining population numbers, range or habitat, making it vulnerable to extirpation in the state.

The Townsend’s big-eared bat has been documented throughout most of Montana, with the exception of the far northeastern corner of the state. They are found at elevations between 1,968 and 7,820 feet. Townsend’s big-eared bats are generally found at low densities across occupied habitats, and Montana is no exception. Only five maternity colonies have been located, ranging in size from less than 20 adult females to an estimated 50-75. The best-known colony is at Lewis and Clark Caverns State Park (approximately 125 miles from the project area), although less than 30 hibernacula have been located, most with just a few hibernating bats (MFWP 2006).

Townsend’s big-eared bats are found in mesic to dry conifer forests, ponderosa pine and limber pine woodlands, juniper, mountain mahogany, riparian, and shrub-steppe habitats where suitable roost sites are present. Studies in other states indicate that Townsend’s big-eared bats also forage over wetlands and agricultural areas. Caves and abandoned mines are the primary roost sites through most of the range, although buildings have been used by maternity colonies in the northern, cooler portions of the range. In Montana, four maternity colonies are in natural caves and one is in an abandoned mine (MFWP 2011a).

The Townsend’s big-eared bat is a moth specialist with over 90 percent of its diet composed of moths. They forage in edge habitats along streams and woodlands, and within a variety of woodland types. They can travel long distances while foraging, including movements of over 90 miles during a single evening (WBWG 2005).

Townsend’s big-eared bats feed on various nocturnal flying insects near the foliage of trees and shrubs, but appear to specialize primarily on small moths. There are reports of gleaning insects from foliage, but most are captured in the air.

Townsend's Big-Eared Bat Project Area Habitat and Documentation

While the project area does not contain caves suitable for hibernacula or maternity colonies, Townsend's big eared bats have been documented from Powell County approximately 30 miles southeast of the project area (USDA Forest Service 2011c). Also suitable foraging habitat occurs at lower elevations. So while the project area lacks hibernacula and roost sites, considering the long distances this species can travel in a single night (WBWG 2005), it is possible that portions of the project area could be utilized for foraging.

Bald Eagle

Methodology and Analysis Area

A bald eagle nest was recently documented south of the project area, therefore, the analysis addresses the availability of, and changes to eagle nest, roost and foraging habitat. Information used includes forest- and district-wide nest observations, state monitoring data and information provided in the Montana Natural Heritage website (MNHP 2011). Potential effects and identification of pdfs (WL-29, 30) were based largely on the 2007 National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007a).

The combined boundary includes the Beaver Creek eagle nest, as well as foraging habitat along the Blackfoot River, therefore, this area was used to evaluate direct, indirect and cumulative effects.

Species Status and Biology

Until recently the bald eagle was listed as Federally Threatened under the Endangered Species Act. However effective August 8th, 2007, the U.S. Fish and Wildlife Service officially delisted the bald eagle and this species has been added to the Northern Region (R1) sensitive species list. The Forest Service would continue to follow management direction outlined in the Montana Bald Eagle Recovery Plan (USDI-BOC 1994) and this species is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The State rank for the bald eagle is S3, and although it may be abundant in some areas, it is potentially at risk because of limited or decline in numbers, range or habitat.

Bald eagles are associated with large bodies of water and major river drainages, which provide most of their foraging opportunities. Wintering habitat may include upland sites, and nesting areas are generally located within larger forested areas near lakes and rivers. In Montana, bald eagles nest in stands containing large trees (greater than 30 inches d.b.h.) with uneven canopy structure, and in direct line of sight of a river or lake generally less than 1 mile away (MFWP 2011a). Nest site selection is dependent upon maximum food availability and minimum disturbance from human activity. Eagles are opportunistic feeders, preying on fish, waterfowl, small mammals and carrion (MNHP 2011). During migration and at wintering sites, eagles tend to concentrate on locally abundant food and often roost communally.

General objectives of habitat management for bald eagles in Montana include; maintaining prey bases; maintaining forest stands currently used for nesting, roosting, and foraging; maintaining potential nest habitat; and minimizing disturbances in nesting territories, communal roosts and at feeding sites (MFWP 2011a).

Bald Eagle Project Area Habitat and Documentation

A new eagle nest was documented in 2011 on private land, approximately 1.5 miles south of the project area in lower Beaver Creek drainage. Also, suitable eagle nest habitat occurs on private and NFS lands within approximately 1 mile of the Blackfoot River. The combined boundary contains approximately 14 miles of suitable foraging/roost habitat along the Blackfoot River, as well as foraging habitat along approximately 25 miles of lower elevation streams in the Beaver Creek, Keep Cool, Lincoln Gulch and Landers Fork drainages.

Black-Backed Woodpecker

Methodology and Analysis Area

The analysis for the black-backed woodpecker (BBW) is based on the northern region model developed by Samson (2006a, 2006b), and the BBW Northern Region Overview (USDA Forest Service 2007c), whereas information from R1-VMAP was used to identify potentially suitable habitat. Also habitat quality is based on work by Russell et al. (2007) and Dudley and Saab (2007), who define "high quality post fire BBW habitat as having the following attributes: a large pre-fire patch size (approximately 200 acres), moderate to high pre-fire canopy cover (40 to 100 percent) and moderate to high burn severity. Data used to evaluate effects to habitat are based on the Black-backed Woodpecker Northern Region Overview – Key Findings and Project Considerations (USDA Forest Service 2007c).

Because BBWs appear to be strongly dependent upon 1- to 6-year-old burns (Hutto 1995; Caton 1996; Hitchcock 1996; Saab et al. 2004), and considering that the combined boundary contains over 20,000 acres of recently burned forest, this area was used to evaluate existing habitat, as well as assess direct, indirect and cumulative effects.

Species Status and Biology

Although the BBW is considered secure with a Global Rank of G5, in Montana it is a species of special concern with a rank of S3 (MNHP 2011). Black-backed woodpeckers are a resident species of Montana, and observations in the State indicate that this species normally does not move outside of its breeding range in the winter (Montana Natural Heritage 2011).

The BBW is considered opportunistic and responds to outbreaks of wood-boring beetles (*Cerambycidae* and *Buprestidae*) and bark beetles (mountain pine bark beetles, *Dendroctus* spp.) in conifer forests following windfall, disease, or fire (Samson 2006a). In the Northern Region the BBW is known to use three types of forest habitat including; (1) post-fire areas, (2) areas with extensive bark beetle outbreaks causing widespread tree mortality, and (3) landscapes with a natural range of disturbances resulting from fire and insect use (Samson 2006a).

Research has shown that use of post-fire habitat is temporary and that beetle foraging woodpeckers like the BBW rapidly colonize stand-replacing burns within 1 to 2 years after the fire (Saab et al. 2007). However the favorable effects of fire are not long-lasting, and population levels of both the bark beetle and wood-boring beetle drop within 4 to 8 years after a fire depending on location (Werner and Post 1985 *in* Samson 2006a). This decline results in reduced densities within 5 years post-fire, after which beetle foraging woodpeckers such as the BBW are considered rare (Saab et al. 2007).

Even though many studies have shown BBWs to primarily use post fire habitat (Hitchcox 1996; Caton 1996, Hejl and McFadzen 2000, Powell 2000, Kotliar et al. 2002 *in* USDA Forest Service 2007c), some studies have found these woodpeckers in areas without recent fire. For example, both Bonnot (2006 *in* USDA Forest Service 2007c) and Goggans et al. (1988 *in* USDA Forest Service 2007c) found BBWs within extensive mountain pine beetle outbreaks that occurred in the absence of fires.

In an effort to document the use of BBW in beetle-killed areas, in 2006 the Avian Science Center and Region 1 (2006c) focused survey efforts for BBWs in beetle outbreak areas (Avian Science Center 2006b). Survey areas were located on the Lolo, Bitterroot, Helena, Beaverhead-Deerlodge and Nez Perce NFs, and 428 point counts were conducted. No BBW were found in beetle outbreak areas during these point counts in Montana. There were two detections of BBW on the Nez Perce NF in Idaho, which gave a detection rate of BBW at 0.46 percent of the points in beetle outbreak areas. A concurrent survey of post-fire areas had a detection rate of BBW at 7.1 percent of the points.

Even though few BBW were located in bark beetle-infested stands in Region 1, these stands may still provide some secondary habitat. Samson (2006b) estimated that 29,405 acres of habitat are needed to maintain a viable population of BBWs across Region 1. Dead and dying trees resulting primarily from MPB are widespread across the Helena National Forest. Even though these dead trees do not provide the abundant food source that post-fire stands produce, this bark beetle habitat alone greatly exceeds the amount of habitat that Samson (2006b) estimated was needed to maintain BBW viability across the entire region.

Suitable post-fire BBW habitat currently occurs on over 200,000 acres of the Helena National Forest. Of this, almost 23,000 acres occur within or immediately adjacent to the Stonewall Project area. While some of these lands have been salvaged, considering the availability of burned habitat regionwide, adequate habitat exists across the landscape to maintain viable BBW populations (Samson 2006a).

Black-Backed Woodpecker Project Area Habitat and Documentation

Black-backed woodpeckers have been observed in the Snow Talon Fire area that contains approximately 22,800 acres of post-fire high-quality BBW habitat, as defined by Russell et al. (2007). In addition, lower quality foraging habitat exists in concentrated areas of MPB mortality, including over 2,000 acres that have experienced tree mortality of 40 or greater trees per acre (Amell and Klug 2015). As a result, and considering that BBWs have been documented adjacent Snow Talon Fire area, the Stonewall Project area is used by this species.

Flammulated Owl

Methodology and Analysis Area

Flammulated owl documentation is based on data derived from the Montana Natural Heritage Database (2011), and the USDA Forest Service Natural Resource Management Wildlife Database (2011c). Habitat is based on information provided in “A Conservation Assessment of the Northern Goshawk, Black-backed woodpecker, Flammulated Owl and Pileated Woodpecker in the Northern Region, USDA Forest Service” (Samson 2006a), “Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher” (Samson 2006b), and “Criteria for Wildlife Models Helena National Forest” (USDA Forest Service 2009a).

Habitat estimates and maps are derived from R1-VMAP, R1-Summary Database and Helena National Forest Summary Database. Methodologies and assumptions associated with this data are described in “Region One Vegetation Council Classification Algorithms” (USDA Forest Service 2006a) , “R1 Grid Intensification using CSE Protocols – Field Procedures” (USDA Forest Service 2007d), “R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System” (USDA Forest Service 2007e), and “FIA Field Guides, Methods, and Procedures” (available at http://fia.fs.fed.us/library/field-guides-methods-proc/).

This species relies heavily on site-specific structural conditions that may be affected by treatment or lack of treatment. As a result, and considering that this area is large enough to evaluate landscape-level conditions that may affect use, direct and indirect effects are evaluated across the project area. However, because flammulated owl have been recently documented within and adjacent to the combined area, this analysis area is used for cumulative effects.

Species Status and Biology

The flammulated owl has a conservation status rank of G4 (NatureServe 2011) and this species is considered uncommon, but usually widespread. The Montana Partner in Flight (PIF) Plan (2000) considers the flammulated owl a Priority Level 1 species; or a species in which Montana has a clear obligation to implement conservation action (PIF 2000).

The flammulated owl is poorly monitored in Montana, but known to have a preference for open, dry forest conditions. It is considered a species potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas. It has a state rank of S3 (breeding) (MNHP 2011).

Flammulated owls are a common raptor of the montane forests of the western United States. They primarily forage on insects, especially moths and beetles (McCallum 1994). They forage by “hawking” which consists of the bird perching on a branch at the lower portion of the forest canopy and waiting for a moth to fly by, or a grasshopper to walk by (Wright 1996). Such foraging behavior is presumably facilitated by the open, park-like conditions typical of ponderosa pine forests. Home range size varies on average from approximately 35 acres in Colorado (Linkhart et al.1998) to 40 acres in Oregon (Goggans 1985).

Flammulated owls are seasonal migrants that occupy home ranges in the northern Rocky Mountains during spring, summer, and early fall. They are strongly associated with ponderosa pine forests during breeding and prefer open, single-storied stand structures for foraging (PIF 2000). The Montana PIF Plan (PIF 2000) considers this species to be associated with forests of dry ponderosa pine and Douglas-fir with open understories, largely covered with grasses and a few shrubs or small clumps of regenerating trees. The flammulated owl subsists nearly exclusively on insects, especially moths and beetles, and forages in the tree canopy and on the ground (Samson 2006a). Linkhart et al. 1998 *in* Samson 2006a) reported a mean territory size of between 27 and 45 acres.

A study by Wright (1992) in the Bitterroot Valley concluded that this species selects for microhabitat features such as large trees and snags, but only within an appropriate landscape context. Flammulated owls were not present unless the larger landscape consisted of open understory ponderosa pine/Douglas-fir forests, and then only where grassland or xeric shrubland openings were present at a home-range scale. Flammulated owls appear to avoid clear cuts and intensively cutover areas, but they would use thinned or selectively logged stands.

Samson (2006a) estimated flammulated owl breeding habitat available in each national forest in R1. These models were then used to query the FIA database, resulting in statistically reliable habitat estimates by national forest. Results indicate that breeding habitat is well distributed regionwide. Although a modest decline in ponderosa pine from 1942 to present has been reported in 9 of 12 national forests, Douglas-fir has increased in abundance more substantially, suggesting an overall increase in habitat for the owl.

Although dry ponderosa pine and Douglas-fir habitat are naturally limited on the HNF (Samson 2006b); FIA estimates prior to the MPB epidemic show flammulated owl habitat exists on approximately 8,000 acres of the HNF, which is 1.7 times the amount needed to maintain a minimum viable population regionwide.

Loss of large-diameter ponderosa pine and increasing stand densities from long-term fire exclusion, are major threats to flammulated owls (Hayward and Verner 1994). Wherever possible, management of dry forest sites should address the needs of flammulated owls by incorporating structural and component complexity at the microhabitat and home range scale in the form of suitable nest snags and trees, open, mature vegetation around the nest site, small clearings, and roost sites in close proximity to each other (PIF 2000).

Flammulated Owl Project Area Habitat and Documentation

The presence of large diameter snags and open understory conditions make it likely that ponderosa pine/Douglas-fir stands that characterized the project area historically met the needs of flammulated owls. Over time preferred habitat conditions have declined due to decades of fire suppression and increased stand density resulting in closed-canopy conditions and smaller-diameter trees. The recent MPB epidemic has increased the availability of large-diameter ponderosa pine snags and opened the forest canopy, improving flammulated owl habitat; however, many of these stands are regenerating conifers, which may make these areas largely unsuitable in the next 20 to 30 years. Potential habitat has been modeled based on methods described above, and currently approximately 1,500 acres of suitable flammulated owl habitat are within the project area. While widely scattered, virtually all of this occurs as low-elevation bottomland and lower-slope ponderosa pine habitat.

While the project area does not provide high quality flammulated owl habitat, and the flammulated owl has not been documented within the project area, flammulated owls were documented in 2005 and 2008 at two locations within 5 miles of the project area, including two within the combined boundary (USDA Forest Service 2011c). Considering this documentation, the increased availability of large-diameter snags, the predominance of ponderosa pine/Douglas-fir at lower elevations, and presence of suitable habitat, it is likely the project is used for foraging, if not nesting.

Samson (2006b) determined that approximately 8,895 acres of habitat would be needed to maintain minimum viable populations of flammulated owls in the Northern Region. Currently, based on FIA data, there are 25,231 acres of flammulated owl habitat on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Boreal (Western) Toad

Methodology and Analysis Area

Information presented on boreal toads is based on Werner et al. (2004), Maxwell et al. (2003), the heritage database (MNHP 2011) and USDA Forest Service (2011c).

Due to the small home range for this species, direct, indirect and cumulative effects are evaluated across the project area.

Species Status and Biology

This species has a global ranking of G4 and is apparently secure, although it may be quite rare in parts of its range. The State of Montana lists the boreal toad as a special concern species with a S2 ranking. As a result, statewide, the boreal toad is an at risk species because of very limited and/or potentially declining population numbers, range and/or habitat.

This toad is a subspecies of the western toad, *Bufo boreas*, which historically was widely distributed across the Pacific Northwest and Rocky Mountains. Adult boreal toads are largely terrestrial and are considered habitat generalists that use a variety of habitats. They generally breed in lakes, ponds and slow streams and roadside ditches, where they prefer shallow areas with mud bottoms (MNHP 2011). Egg laying usually takes place 1 to 3 months after the snow melts (Reichel and Flath 1995, Werner et al. 2004 *in* NatureServe 2011). These toads may wander miles from their breeding sites through coniferous forests and subalpine meadows, lakes, ponds and marshes (Werner et al. 2004). Generally boreal toads are active during the day and night, with the active period generally running from April or May through October in Montana (MNHP 2011).

In Montana, this toad occurs in mountainous terrain on both sides of the continental divide. These toads were once common and widespread in western Montana, but they are now uncommon and few breeding populations were found in recent surveys on six national forests in the state (Werner et al. 2004). Declines have also been noted in adjacent states (Reichel and Flath 1995). There are no clear reasons for these declines, and possible causes range from acid rain, pesticides, parasites, ozone depletion, and habitat loss and climate change. Declines have even been noted in remote locations such as wilderness areas and national parks.

Primary risk factors include those that affect breeding and riparian habitat; including activities that result in the elimination of key riparian vegetation or that adversely affect water quality.

Boreal (Western) Toad Project Area Habitat and Documentation

Boreal toads have been documented at two locations within the project area including Reservoir Lake in the head of Beaver Creek, and at the confluence of Klondike and Beaver Creek. They have also been found at numerous locations within the combined area including Red Creek, several locations within Copper Creek and south of the project area on private land along Stonewall Creek. Numerous juveniles and tadpoles have also been documented at Snowbank Lake in 2004, a year after the Snow Talon fire (MNHP 2013). Potentially suitable breeding habitat is widespread and the project area contains approximately 30 acres of wetlands and open water habitat, and 66 miles of streams and numerous roadside ditches (MNHP 2011). As a result, project area riparian and upland habitat is utilized for both breeding and dispersal. .

Management Indicator Species

Management indicator species (MIS) are used in concert with other indicators to gauge the effects of management on wildlife habitat. Management indicator species represent groups of wildlife associated with similar vegetative communities or key habitat components. In general, the MIS approach is used to reduce the complexity of discussing all the wildlife species on the Forest. Evaluating the effects of management practices on selected MIS and their habitat also displays the effects of alternatives on the ecological communities they represent and helps to ensure that biodiversity is maintained. Forest MIS include the northern goshawk, pileated woodpecker, hairy woodpecker, and American marten. The following is a summary of habitat conditions for Helena National Forest MIS that have been documented and either occur or are likely to occur within the project area.

Methodology and Analysis Area

The Helena Forest Plan provides specific direction related to providing for and managing old-growth habitat, which is described below. Old growth definitions are based on Green et al. (2005 errata). More detailed information can be found in the Forest Plan (USDA Forest Service 1986).

The National Forest Management Act (1976) and Forest Service direction prescribe an ecological approach to old growth that considers it important to biological diversity (Green et al. 2005 errata). The Helena National Forest Plan (USDA Forest Service 1986) also recognizes old growth as an important forest component and 5 percent of each 3rd-order drainage is to be managed for old growth. All stands meeting old growth definitions (as defined by Greene et. al. 2005 errata) are designated old growth. If this amount does not constitute at least 5 percent of each 3rd-order drainage than additional stands would be designated.

The Stonewall Old Growth and Snag Report (Amell and Higgins 2014) summarizes the Forest process related to old growth, and identifies the steps used in designating old growth within 3rd-order drainages, as well as identification of lands outside drainages that are managed as old growth.

The analysis boundaries used to evaluate old-growth habitat and effects to old-growth-dependent species vary and are described under the specific species sections.

Existing Old Growth

Following the process identified in the project old growth report, 5 percent of each 3rd-order drainage was designated as old growth. Additionally, because over half of the project area occurs outside of the 3rd-order drainages, and to better identify old growth across the landscape, lands to be managed as old growth outside of 3rd-order drainages were also identified. Therefore, the project area contains 592 acres of designated old growth within 3rd-order drainages, as well as 175 acres of verified old growth and 436 acres of potential old growth on NFS lands outside of the 3rd-order drainages. These lands are summarized by analysis area in table 75 and displayed in figure 72.

Table 75. Existing project area old growth

Old Growth by Analysis Area	Acres
Project Area	
Designated old growth	592
Other old growth[1]	611
Total old growth	*1,203*
Cumulative Effect Boundary	
Designated old growth	1,415
Other old growth	611
Total old growth	*2,026*

1 – meets the old growth definition identified by Green et.al. 2005, 2007, 2008 errata

Designated old growth is widely scattered across the cumulative effects analysis area and includes one block greater than 100 acres (112 acres), eight blocks between 50 and 100 acres and 28 blocks less than 50 acres. Also all of the project area old growth occurs in the western half of the area in the headwaters of Beaver Creek and Lincoln Gulch. Old growth MIS include northern goshawk and pileated woodpecker. The following is a discussion of the status, biology and project area habitat for each species.

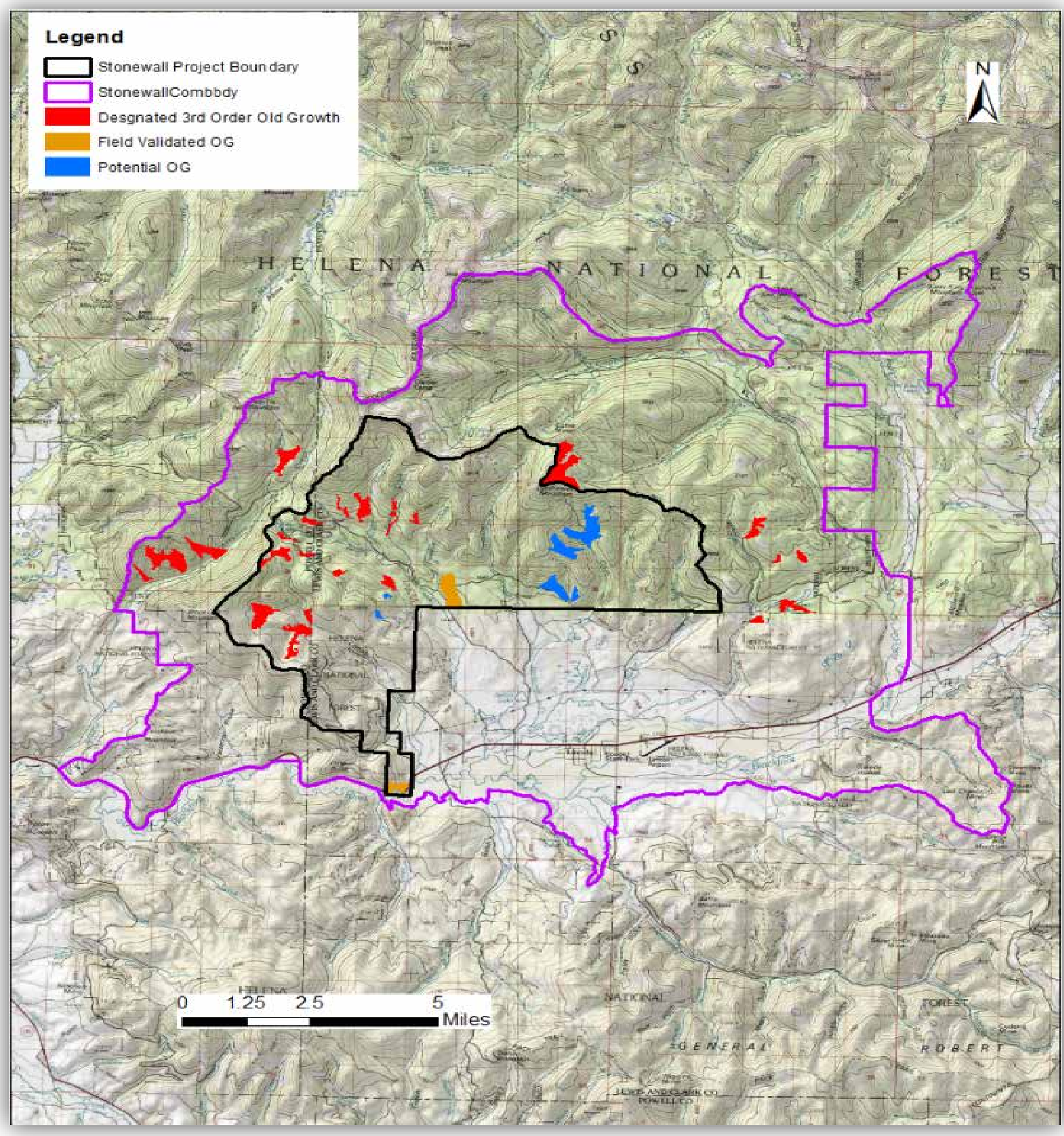


Figure 72. Project and Combined Boundary Old Growth

Northern Goshawk

Methodology and Analysis Area

Documented use is based on Forest and District observation and monitoring data, the Heritage Database (MNHP 2011) and the USDA Forest Service NRM Database (USDA Forest Service 2011c). Habitat information is based largely on the Northern Region Model (Samson 2006a) and Conservation Assessment (Samson 2006b) for this species, as well as information provided in USDA Forest Service 2006b, USDA Forest Service 2007e, USDA Forest Service 2009c and "Criteria of Wildlife Models on the Helena National Forest" (USDA Forest Service 2009a). Effects are evaluated by looking at changes in nesting, foraging and post-fledgling habitat (Samson 2006a, b) and the “Northern Region Overview: Key Findings and Project Considerations” (USDA Forest Service 2009c).

Recent MPB mortality has reduced canopy closure in much of the project area, so goshawk habitat in the project and cumulative effects areas are based on R1-Vmap values using MPB post-kill data. Modeled habitat includes nest habitat, or dominant tree types include Douglas-fir, ponderosa pine, lodgepole pine, aspen, and mixed stands with tree sizes greater than 10 inches in diameter and canopy cover greater or equal to 25 percent, and foraging habitat, or dominant tree types include Douglas-fir, ponderosa pine, lodgepole pine, aspen and mixed stands with greater than or equal to 40 percent canopy closure. Diversity matrices are also used to describe foraging habitat and the post-fledgling area (PFA) (USDA Forest Service 2009c). Samson (2006a) and (USDA Forest Service 2009c) provide a detailed rationale on the basis for these structural characteristics used to describe goshawk habitat.

All recent goshawk nesting occurs within the project area, which provides adequate habitat for the home range of existing nests, therefore, direct and indirect effects are evaluated across the project area. The combined boundary was used to assess cumulative effects because historical use occurred within the combined boundary, and this area includes impacts from recent wildfire as well as private land influences.

Species and Population Status

The northern goshawk has a conservation status rank of G5 (NatureServe 2011) and this species is considered globally secure (common; widespread and abundant). In Montana it is identified as a species of special concern with an S3 ranking (MNHP 2011). The Montana PIF Conservation Plan identifies the northern goshawk as a priority II species or a species that the State is responsible for monitoring regarding status and conservation actions (PIF 2000).

The North American Breeding Bird Survey (BBS) indicates that northern goshawk trends have been increasing since 2002 for the northern Rockies Region, which extends from Wyoming into southerly portions of Canada (Available at: http://www.mbr-pwrc.usgs.gov/bbs/bbs.html). Data specific to Montana indicate that goshawk trends have been declining since 1966. However Anderson et al. (2005 p. 7) concludes that BBS data are inadequate to estimate population trends for goshawks because the number of routes where goshawks are detected and the encounter rate of goshawks are too low.

Some authors have hypothesized that goshawk populations may be declining (Bloom et al. 1986 *in* Anderson et al. 2005; Zinn and Tibbits 1990 *in* Squires and Kennedy 2006). Hoffman and Smith (2003) analyzed migration data and concluded that uncertainty exists as to the status of western goshawk populations, and Kennedy (1997) and Anderson et al. (2005) concluded that current sampling techniques may be inadequate to determine if goshawk populations are declining, increasing or stable. Finally Squires and Kennedy (2006) conclude that this difficulty is due to several factors, including that goshawks are secretive and difficult to survey and that many studies have small sample sizes.

The most recent petition for listing the goshawk under ESA occurred in 1997. After a formal 12-month review by a scientific committee, the USFWS determined that listing under ESA was not warranted. Analysis of data from 17 states comprising 222 million acres indicated “that the goshawk population is well distributed and stable at the broadest scale.”

Until June 2007, the northern goshawk was listed as a Region 1 sensitive species. However, regional studies demonstrated that (1) habitat exists to support reproductive individuals on each forest, (2) habitat is well distributed, and (3) individual goshawks can interact with one another across the region; hence, the goshawk did not meet the sensitive species criteria in FSM 2670.5 and was removed from the R1 sensitive species list. Although the goshawk is no longer a sensitive species, on the HNF the goshawk is considered an MIS and analysis of goshawks and their habitat are assessed at the project and forest levels.

Species Biology

Goshawks are the only large diurnal raptor adapted to interior forest environments in the northern Rockies. Key elements of goshawk habitat are extensive blocks of mature forest with groups of large nesting trees, abundant prey (squirrels, grouse, hares, larger songbirds), and mid-level flyways. Goshawks are most commonly associated with mature and old-growth Douglas-fir and ponderosa pine forest. However, surveys over the past 15 years on the Helena, Beaverhead-Deerlodge, Lewis and Clark, and Medicine Bow National Forests have found that goshawks make extensive use of lodgepole pine stands as long as the basic structural attributes that they require are in place and prey is adequate (Lemke 1994; Squires and Ruggiero 1996).

In the more fragmented forest environments east of the Continental Divide where mountains and plains intermingle, goshawks often occupy mosaics of forest and grassland or a mixture of different forest seral stages. They are capable of foraging through open parks and woodlands and along forest edges, and in certain circumstances do so on a regular basis. Competition from red-tailed hawks and great-horned owls confines goshawks to dense forest, but this applies primarily to nest sites and potential predation on young rather than to foraging by adults (Reynolds et al. 1992).

In Montana the northern goshawk is a year-round resident (MFWP 2011a) and breeding season habitat includes three areas including the nest area, post-fledgling area (PFA) and foraging habitat. The following is a discussion of each.

Nest Habitat

Although the goshawk is considered a habitat generalist and uses a wide variety of forest types, it tends to nest in a relative narrow range of structural conditions (Reynolds et al. 1992; Squires and Reynolds 1997; Kennedy 2003). Goshawks prefer mature forests with large trees, relatively closed canopies and open understories (Reynolds et al. 1992; Hayward and Escano 1989; Squires and Reynolds 1997). Despite differences in some habitat characteristics, high canopy closure and tree basal area at nest areas were the most uniform habitat characteristic between study areas in northern Idaho and western Montana (Hayward and Escano 1989; Kennedy 2003; Clough 2000). Goshawk nest sites include the nest tree and approximately 40 acres around the nest (USDA Forest Service 2009c) and breeding areas often contain several alternate nests that are used over several years and are usually located within 0.25 mile of each other (Roberson et al. 2003). Because of their large home ranges and their natural tendency to cycle among different nest sites between years, they are able to adapt to many environmental changes (such as fire and timber harvest) by moving to adjacent undisturbed sites.

Key findings in the literature that characterize nest areas include; (1) goshawks nest in a variety of forest types throughout their range, (2) in general, the nest area vegetation is described by a comparatively narrower range of structural characteristics than the post-fledgling area (PFA) or foraging area, and includes mature forests with larger trees and relatively closed canopies, (3) average size of the nest area varies, and (4) in west central Montana, goshawks selected nest stands of mature and older forest approximately 40 acres in size and surrounded by a mix of younger and nonforested habitat (USDA Forest Service 2009c).

More than habitat composition or any other factor (i.e., prey abundance), territoriality determines nest distribution and spring weather determines nest success (Joy 2002; Reich et al. 2004).

Post-fledgling Area Habitat

The post-fledgling area (PFA) habitat surrounds the nest area and is defined as the area used by the family group from the time the young fledge, until they are no longer dependent on the adults for food (Roberson et al. 2003). During the fledgling-dependency period (4 to 6 weeks) the activities of young are centered near their nests, with the distance they move from the nest increasing over time (ibid.). These areas may be of importance to fledglings by providing prey items to develop hunting skills, as well as cover from predators and prey.

The Northern Region recommends that each pair of nesting goshawks should be provided with a 420-acre PFA within their home range (USDA Forest Service 2009c). Based on habitat and occupancy data collected in northern Idaho, the region recommends maintaining at least 40 percent of the PFA in trees greater than 5 inches d.b.h., with greater than 50 percent canopy cover, and some structural diversity in the understory (USDA Forest Service 2007c). Unlike foraging habitat, post-fledgling habitat is actively defended (USDA Forest Service 2007c).

Foraging Habitat

Goshawks are opportunistic predators that kill a wide assortment of prey that varies by region, season, vulnerability, and availability. Main foods include small mammals, ground and tree squirrels, rabbits and hares, large passerines, woodpeckers, game birds, and corvids (Squires and Reynolds 1997). Goshawks are classified as prey generalists (ibid.) and typically forage on a suite of 8–15 species (Reynolds et al. 1992). Preferred goshawk foraging habitat varies in the literature (USDA Forest Service 2009c), however key findings or conclusions that characterize goshawk foraging include:

1. Size of the typical home range or foraging area for the goshawk (1,409 to 8,649 acres) may vary depending on prey abundance and availability, age and sex of the bird and local habitat conditions.
2. Goshawk foraging areas are heterogeneous and may include mature forest, as well as a mix of other forest and nonforest components.
3. Emphasis should be placed on creating or maintaining vegetation diversity and that a juxtaposition of seral stages including mature timber should be provided (USDA Forest Service 2009c).

Goshawk foraging areas are approximately 5,000 acres and comprised of a diversity of vegetative types. The composition of vegetative types characterized by higher canopy closures, mature trees, and open understory conditions located outside the nest area blend into the surrounding landscape beyond the PFA scale, to the degree that differences in habitat composition in occupied versus random foraging areas cannot be detected (McGrath et al. 2003 in Samson 2006a). As such, management efforts are generally concentrated at the PFA and nest area scales.

Home Range and Landscape Considerations

Goshawks use large landscapes, integrating a diversity of vegetation types over several spatial scales to meet their life-cycle needs (Squires and Kennedy 2006). In The Northern Goshawk Status Review (2009c), the U.S. Fish and Wildlife Service found that the goshawk typically uses mature forests or larger trees for nesting habitat, however, it is considered a forest habitat generalist at large spatial scales (USDI Fish and Wildlife Service 1998). The Service found no evidence in its finding that the goshawk is dependent on large, unbroken tracts of “old growth” or mature forest (63 FR 35183 June 29, 1998) (USDA Forest Service 2009c). Nonetheless, the pattern of goshawk nest site selection in coniferous forests, especially mature forests with closed canopy and open understory conditions, has emerged repeatedly in numerous studies throughout western North America (Squires and Ruggiero 1996; Clough 2000).

The issue of goshawks selecting for some level of mature forest in the home range was the subject of recent debate in the literature. Greenwald et al. (2005) prepared a literature review of a few selected studies and concluded that goshawks select mature to older forests in their home range. Greenwald et al. (2005) criticized Reynolds et al. (1992) on their recommendation to maintain a mix of seral stages and vegetation types that reflect historical landscape patterns. Reynolds et al. (2007) provided a rebuttal to Greenwald et al. (2005) finding that Greenwald's criticisms were based on an incomplete review of the literature; misunderstandings of the desired goshawk habitats described in the "Management Recommendations for the Northern Goshawk in the Southwestern United States" (Reynolds et al. 1992); an under-appreciation of the extent of variation in vegetation structure among forest types and seral stages used by goshawks; a limited understanding of the ecological factors limiting goshawks; and a failure to understand the dynamic nature of forest habitats. Reynolds et al. (2007) findings were consistent with the Service's 1998 status review of the species (USDI Fish and Wildlife Service 1998).

The breeding season home range for the northern goshawk varies depending on sex and habitat characteristics (Squires and Reynolds 1997) and can range from 1,250 acres to over 6,000 acres (Squires and Reynolds 1997; Reynolds et al. 1992; Kennedy 2003). Also several authors have suggested that forested habitat for the northern goshawk should be managed at both the landscape and stand levels to provide adequate foraging and nesting habitat (Reynolds et al. 1992). In order to meet all the nesting requirements of this species, the Northern Region goshawk guidelines recommend that at least 240 acres of nesting habitat should be maintained in patches of at least 40 acres per home range. Recommendations related to providing desired home range and PFA habitat also include maintaining a variety of habitat conditions and a mosaic of vegetation structural stages (USDA Forest Service 2009c). Finally sustaining goshawks across the landscape requires maintaining habitat at the home range scale (Reynolds et al. 1992).

Viability

The four criteria used to evaluate goshawk viability are (1) habitat availability, (2) human disturbance, (3) biotic interactions, and 4) managing for ecological processes. The following is a brief discussion of each, from which effects of proposed actions are evaluated.

Habitat Availability

Currently habitat is abundant for the northern goshawk in the Northern Region, as well as by national forest and ecological region. Samson (2006b) determined that approximately 133,436 acres of habitat (nesting and foraging) would be needed to maintain minimum viable populations of northern goshawks in the Northern Region. Currently, based on FIA data, there are 361,963 acres of northern goshawk habitat (nesting and foraging) on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Human Disturbance

Northern goshawks in the Northwest United States are reported to select areas to nest near human activities (McGraath et al. 2003 *in* Samson 2006a). Human disturbance is not a factor for northern goshawks as long as 70 percent of the nest stand structure is maintained and timber management operations are restricted.

Biotic Interactions

Inter-specific competition for habitat and prey is not well understood. Other raptors may exclude goshawks from nest areas, although goshawks and other raptors are known to nest in close proximity to one another (Squires and Kennedy 2006). Numerous raptors and mammalian predators prey on many of the same species as goshawks. These predators include red-tailed hawk, Coopers hawk, great horned owl, barred owl, fox, coyote, Canada lynx, weasel, and American marten (Squires and Kennedy 2006, Samson 2006a). The extent to which species co-exist with goshawks may depend on the openness of habitat (USDI Fish and Wildlife Service 1998). Natural and man-made changes that result in reduced forest canopy may favor the habitat needs of more open-forested competitors, such as red-tailed hawks, and reduce goshawk habitat; although to date no scientific studies have conclusively documented such a replacement. Reynolds et al. (1992) recommend vegetation management treatments that maintain habitat at a home-range scale to sustain goshawks across the landscape.

Ecological Processes

While suppression of natural fire processes in the Northern Region has benefitted the northern goshawk by increasing the distribution and abundance of forested habitats, it has also resulted in increased fuel loading and creation of ladder fuels that puts existing goshawk habitat at risk. Additionally, fire and other ecological processes are important to maintain a continuing supply of mature trees, and either an understory or open understory depending on need (e.g., PFA vs. foraging and heterogeneity required in foraging habitat) (Samson 2006a). Consequently, re-introduction of fire needs to be implemented in order to maintain preferred goshawk habitat conditions, while reducing the risk of long-term loss of habitat from catastrophic wildfire.

Northern Goshawk Project Area Habitat and Documentation

Goshawk use within the project area includes both historical (1995) documentation, as well as recent activity, including two active goshawk nests located in 2010. Young goshawks successfully fledged from one of these nests. While the second nest did have young, the defense of the nest by the adults precluded a final determination on fledging status. The nest from which goshawks successfully fledged in 2010 was active again in 2011; however, nest success was not determined. Both active nests (Stonewall East and West) are located in the southern portion of the project area on lower slopes within 0.25 mile of drainages (see figure 73).

Nesting and Forging Habitat R1-VMAP Analysis

R1-VMAP is used to describe nesting and foraging habitat in the project area and within the combined boundary or cumulative effect area, according to models developed by Samson (2006a, b) as described in the Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009a). Of the project area acres, approximately 758 acres and 1,051 acres of nesting and foraging habitat respectively are also designated as old growth.

Existing nesting and foraging habitat for both the project and cumulative effect areas is summarized in table 76 and displayed in figure 73. Due to MPB mortality, goshawk nesting habitat has declined from 13,205 acres (48 percent reduction), and foraging habitat has declined from 18,841 acres (57 percent reduction).

Table 76. Existing goshawk nesting and foraging habitat (Samson 2006a)

Analysis Area	Size	Nesting Habitat		Foraging Habitat	
	Acres	Acres	Percent	Acres	Percent
Project Area	24,005	6,342	26	4,445	19
Cumulative Effect Area	101,977	17,258	17	9,437	9

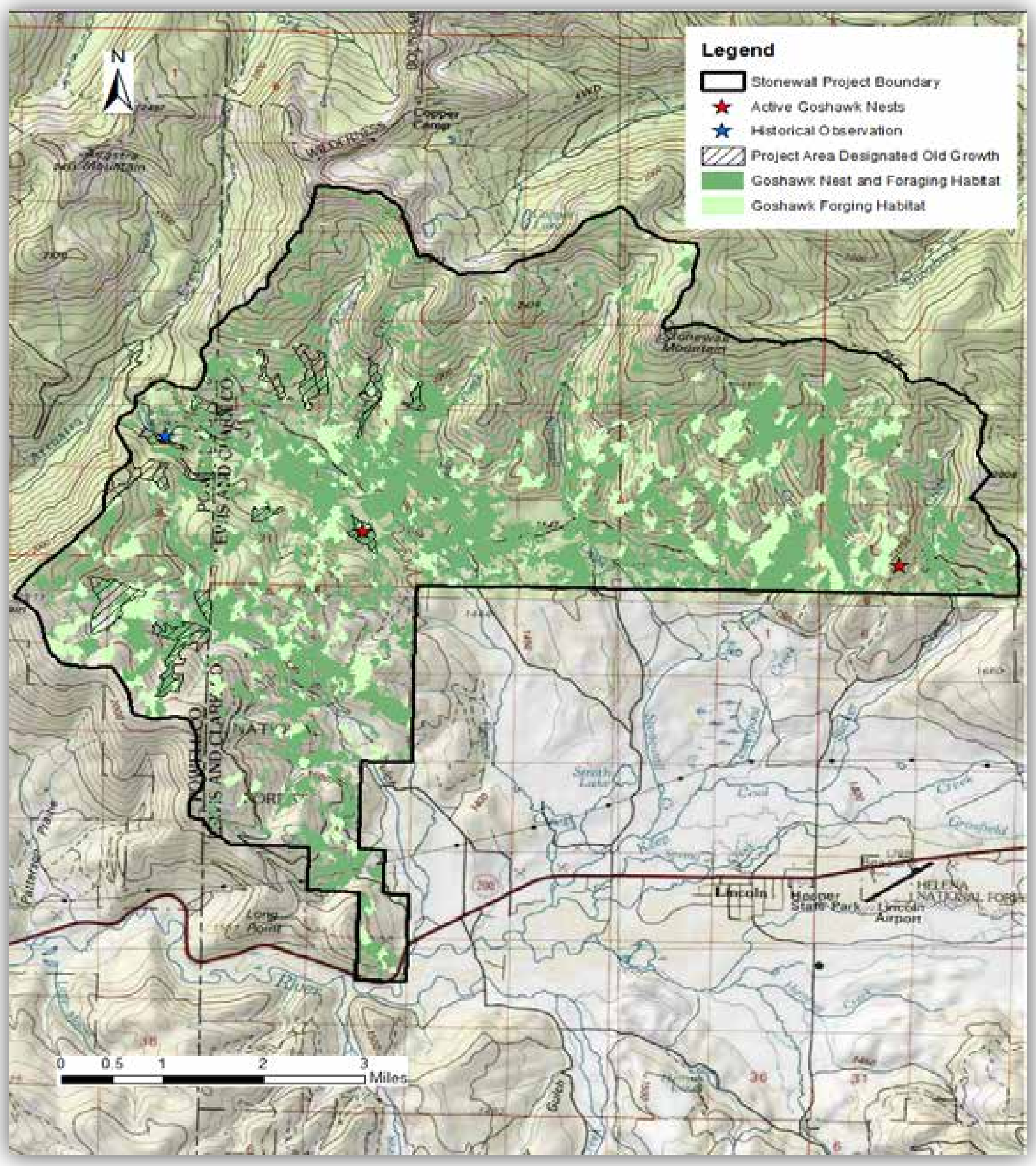


Figure 73. Project area goshawk habitat and nest sites

Home Range Analysis

Foraging Habitat

Goshawk nesting and foraging habitat characteristics in the project area and PFA are based on diversity matrices described in the guidelines identified for the Northern Goshawk Northern Region Overview: Key Findings and Project Considerations (USDA Forest Service 2009c). Table 77 summarizes the vegetation composition of suitable habitat from Reynolds et al. (1992) and Clough (2000) and compares it with habitat conditions within the project area.

Table 77. Percent of goshawk nesting and foraging habitat recommendations[3]

Landscape Habitat	Clough (Montana)	Reynolds[1] (SW U.S.)	Project Area Habitat
Seedling/Sapling (0-4.9 inch d.b.h.)	9.3%	10%	16%
Young Forest (5-9.9 inch d.b.h.)	65.7%[1]	20%[1]	44%
Mature Forest (10 inch+ d.b.h.)	11.3%	60%	35%
Mature (>40% CC and > 5 inches d.b.h.)[2]	69.0%[2]	60%[2]	18%
Grass/Forb/Shrub	7.3%	10%	4%

1 – recommended size class in Reynolds for young and mature forest is 5-12 inches d.b.h.

2 – includes stands with >50 percent canopy cover

3 – based on Reynolds et al.(1992) and Clough (2000)

Clough's (2000) and Reynolds et al. (1992) findings for grass/forb stands or natural openings and young seedling stands are similar to each other despite vegetative differences between the two regions, although grass/forb/shrub habitat within the project area falls below both authors findings. Conversely the project area contains a larger amount of seedling/sapling stage forest. The two authors differ in that in Montana a high percentage of young forest was used, whereas mature forest predominated in the Southwest. Existing project area habitat falls between the two, whereas it falls well below the amount of closed canopy forest that characterizes goshawk home ranges in both Montana and the Southwest United States. While the project area deviates somewhat from conditions found by Clough (2000) and Reynolds et al. (1992), it has a diversity of habitat conditions and provides habitat conditions consistent with goshawk use.

Nest Habitat

Reynolds et al. (1992) recommends that 5,000 acres of habitat (home range) are needed to support a nesting pair of goshawks. Recommendations are that 40 acres of habitat be provided at each nest site, and a total of 240 acres of nest habitat should be available for each home range (USDA Forest Service 2007f). The project area contains over 6,300 acres of nest habitat. Of this approximately 4,100 acres occur in blocks greater than 40 acres in size. The project area is large enough to support four, 5,000-acre home ranges, and contains adequate nest habitat per home range (i.e., greater than 240 acres in 40-acre blocks). Thus, there is more nesting habitat available in the project area than the amount that is needed to provide for four nesting pairs of goshawks; according to Reynolds et al. (1992) guidelines that recommend at least 180 acres in patches of 30 acres or more of nesting habitat per pair, or according to the Northern Region Overview (USDA 2009b) guidelines that recommend up to 240 acres per pair in patches of 40 or more acres.

Post-Fledgling Area Habitat

The PFA area includes 420 acres immediately around the nest site that are used by young-of-the-year. Table 78 displays PFA habitat for the Stonewall east and west nests, and compares it with PFA conditions documented by Clough (2000) and Reynolds et al. (1992).

Table 78. Research Findings on Percent Vegetation Composition of PFA Compared to Stonewall PFAs*

Structural Condition	Clough	Reynolds	Project Area PFAs	
			Stonewall East	Stonewall West
Forest	92.7%	90%	100%	99%
Shrub/herb	7.3%	10%	<1%	0%
Trees (<4.9 inches d.b.h.)	9.3%	10%	19%	12%
Trees (5.0-9.9 inches d.b.h.)[2]	65.7%	20%	53%	37%
Trees (>10 inches d.b.h.)	11.3%	60%	28%	51%
Canopy Cover (>40% and >5.0 inches d.b.h.)	68.9%[1]	60%[1]	23%[1]	31%[1]

*Based on R1-VMAP

1 – use 50 percent canopy closure

2 – recommended size classes in Reynolds for young forest is 5-12 inches d.b.h.

Both PFAs are similar to landscape-level habitat in terms of the amount of seedling/sapling and young forest. While the amount of closed-canopy, mature forest falls short of that characteristic of other PFAs studied, the Stonewall West PFA contain three times the amount of closed-canopy forest than the project area as a whole. Similarly, the amount of closed-canopy mature forest in the Stonewall East PFA is well above that found across the landscape. So while the composition of the existing PFA habitat is similar to that found across the landscape for most structural attributes, the data indicates that areas that contain more closed-canopy conditions are being selected as nest sites.

Both PFAs lack the grass/forb/shrub component that is commonly associated with goshawk PFAs (Clough 2000; Reynolds et al. 1992), and both nests are approximately 0.50 mile from an open road.

Pileated Woodpecker

Methodology and Analysis Area

Potential effects to this species are evaluated by looking at changes in the availability of large-diameter snags and suitable nesting and foraging habitat. Pileated Woodpecker habitat models are derived from A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region, USDA Forest Service (Samson 2006b), Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2006b), and Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009a). Analysis area documentation is based on the Heritage and Forest Service NRM Databases (MNHP 2011; USDA Forest Service 2011c), landbird survey data and field observations.

Minimum habitat model values (USDA Forest Service 2009c) are based on R1-VMap values and include Douglas-fir, ponderosa pine, aspen and mixed forest types that contain tree sizes greater than 10 inches d.b.h. to include forage and nest trees. Landscape-level old-growth estimates are nonspatial and are based on FIA and intensified grid data. Old-growth polygons at the 3rd order drainage scale are mapped using stand exam data.

Habitat estimates and maps are derived from the HNF Intensified Grid Summary Database. Methodologies and assumptions associated with these data are described in the following documents: Region One Vegetation Council Classification Algorithms (updated 2006a), R1 Grid Intensification using CSE Protocols – Field Procedures, R1 Multi-level Vegetation Classification, Mapping, Inventory, and

Analysis System (USDA Forest Service 2007e), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/. Methods related to snag and coarse woody debris are described under the section that addresses dead wood.

Species Status and Biology

Although common in parts of its range, the pileated woodpecker has a global ranking of G5 which is defined as common, widespread and abundant. Although it may be rare, it is not vulnerable in parts of its range. It has a state ranking of S3 (potentially at risk) and is a species of concern that is potentially at risk (MNHP 2011). The North American Breeding Bird Survey indicates that pileated woodpecker trends have been increasing since 1966 (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

The pileated woodpecker is used as an indicator of old-growth forests primarily because of its preference for large-diameter snags as nest trees that tend to occur more frequently in mature forests (Bull and Holthausen 1993, Bull and Jackson 1995). While forest with structure characteristic of old growth are preferred, this species is not an old-growth obligate and the presence of large trees for nesting appears to be more important than forest age.The pileated woodpecker also appears to do well in young and fragmented forests with abundant remnant older structure (Kirk and Naylor 1996).

Many tree species are used by the pileated woodpecker to excavate nest cavities and selection of the tree appears to depend mainly on the availability of suitable trees (McClelland and McClelland 1999). The pileated woodpecker can excavate a cavity in solid wood (Bull 1987) but most often uses trees partially softened by fungal decay. Pileated woodpeckers excavate a new cavity each year and reuse of old cavities is rare (Bull and Jackson 1995).

In the Northern Rockies, pileated woodpeckers tend to use mature cottonwood bottoms, mixed conifer, and ponderosa pine, among other habitats (Hutto 1995). Forests with a component of western larch, ponderosa pine, or black cottonwood are also used in the northern Rocky Mountains (McClelland and McClelland 1999). Bull and Holthausen (1993) found that the presence of snags greater than 20 inches d.b.h. were found to be the best predictor of occupied habitat.

Dead and downed trees and snags are used for nesting and foraging (Bull 1987). They forage primarily for carpenter ants and other wood boring beetles in both live and dead wood, and often forage on or near the ground in logs, snags, live trees and stumps (Bull and Holthausen 1993). The literature does not define any size requirements for foraging material, although the consensus from researchers (Bull 1987; McClelland 1977) is that the larger and more abundant the material, the more opportunities it will provide for foraging pileated woodpeckers.

In general, there is a positive correlation between forest age and the amount of wood decay (McClelland and McClelland 1999). So, while this species prefers late-successional and old-growth habitat, foraging within younger stands is documented and territories are not confined just to old-growth habitat (McClelland et al. 1979 *in* USDA Forest Service 2008a). Bonar (2001 *in* Samson 2006a) found that the pileated woodpeckers used all available habitats at all scales to select suitable nest cavity trees and foraging habitat.

Pileated woodpeckers are very mobile and are considered a large patch size species There home range is large and requires a high percentage of unlogged forest with a good distribution of large trees. In the Northern Region their home range size is considered to be approximately 1,000 acres (Samson 2006a). Smaller home ranges tended to have a high percentage of the area in grand fir, old growth, unlogged stands and stands with greater than or equal to 60 percent canopy closure (Bull and Holthausen 1993).

Pileated Woodpecker Project Area Habitat and Documentation

Forest pileated woodpeckers monitoring has included recorded observations since 1994, data provided by the Northern Region Landbird monitoring program and Birds and Burn surveys. Pileated woodpeckers are not common on the Forest. Westside forests generally have between 5 and 10 percent occurrence rates compared to 1.5 percent on the HNF (USDA FS 2008d). While uncommon, most occurrences have been around the Stonewall Mountain area and foraging activity was observed in several stands.

Pileated woodpecker habitat in the project area generally includes stands with moderate to high levels of canopy closure that contain overstory inclusions of large ponderosa pine. These stands historically met the needs of pileated woodpeckers because large, ponderosa pine snags provided nest habitat and other smaller snags of a mix of species and down woody debris provided habitat for carpenter ants, and excellent foraging habitat. Existing pileated woodpecker habitat within the project area and cumulative effects area are summarized in table 79 and displayed in figure 74. Due to MPB and high stand densities, canopy cover has been declining and mortality of large ponderosa pine within the project area has been high, increasing the availability of large-diameter snags. While pileated woodpeckers have been documented in areas affected by MPB mortality (Dresser et al. 2012), within the next 10-20 years most snags will fall to the ground and nest tree availability will decline. The dense Douglas-fir understories that develop will hinder ponderosa pine regeneration and reduce recruitment of future ponderosa pine and large-diameter snags. Recent wildfires have also reduced habitat and the large amount of unsuitable habitat in the northeast portion of the CE area is due to the 2003 Snow Talon fire.

The home range size for a pair of pileated woodpeckers depends on the suitability of the nesting and foraging habitat. Suitable habitat is generally characterized as areas with greater than 30 percent canopy cover and tree size greater than 20 inches diameter for nesting and greater than 10 inches diameter for feeding. The less suitable a given area is the more habitat that is needed to meet the needs of pileated woodpeckers. Because project area canopy cover and suitable pileated woodpecker nest habitat has been reduced, it is likely that a pair of pileated woodpeckers in the project area would need up to 1,000 acres per home range. Assuming that a nesting pair of pileated woodpeckers requires 1,000 acres per home range, the project area can currently support up to seven nesting pairs.

Table 79. Existing pileated woodpecker habitat

Analysis Area	Acres	Percent
Project Area	7,824	33
CE Area	27,178	27

Samson (2006b) determined that approximately 91,923 acres of habitat (nesting and foraging) would be needed to maintain minimum viable populations of pileated woodpeckers in the Northern Region. Currently, based on FIA data, there are 193,112 acres of pileated woodpecker habitat (nesting and foraging) on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

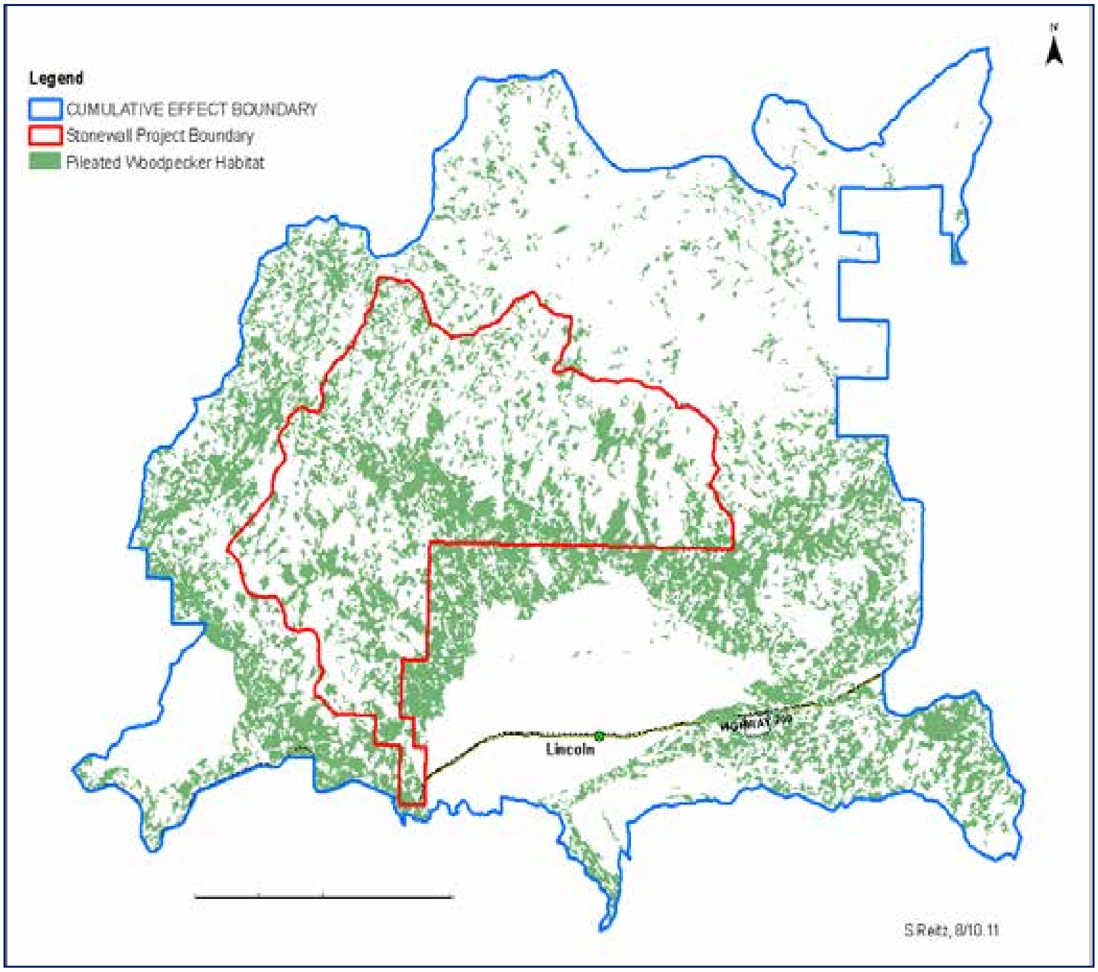


Figure 74. Existing pileated woodpecker habitat

Current Snag Availability

Due to decades of overstocking and widespread MPB mortality, snags and coarse woody debris currently occur in a variety of size classes and are widespread and abundant across the Stonewall Project area. Data collected in 2007 and 2008 show that there were an average of about 40 snags per acre greater than or equal to 7 inches d.b.h., which is 20 times the Forest Plan requirement of providing 70 percent of optimum. Table 80 summarizes snags by size class within the Stonewall Project area, whereas snag distribution is displayed in figure 67. It should also be noted that due to ongoing mortality, particularly in larger diameter ponderosa pine, the availability of 20-inch snags today would be greater than indicated in table 80, which is based on 2008 data.

Table 80. Snag distribution data by size class from 2008 FIA plots

Diameter (d.b.h.) Class	Average Snags per Acre
7-11	26
12-19	13
>=20	1
Total	**40**

Hairy Woodpecker

Methodology and Analysis Area

Documentation of this species is based on field observation, landbird data and data provided in the Heritage Database (MNHP 2011). Hairy Woodpecker habitat models are derived from the R1 Draft Model Set All Species (USDA Forest Service 1998) as described in the Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009a), based on R1-VMap values and include: dominant tree types Douglas-fir, ponderosa pine, Engelmann spruce, and aspen as well as mixed stands that include these types (with the exception of Engelmann spruce), tree sizes greater than 10 inches diameter, and canopy cover greater than 10 percent.

Habitat estimate maps are derived from R1-VMAP. Methodologies and assumptions associated with these data are described in the Region One Vegetation Council Classification Algorithms (updated USDA Forest Service 2006a), and R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System (USDA Forest Service 2009c).

Because of this species' small home range and the widespread availability of suitable habitat, direct, indirect and cumulative effects are evaluated across the project area.

Species Status and Biology

The hairy woodpecker has a state ranking of S5 and although it may be uncommon, in parts of its range it is considered common, widespread and abundant (MNHP 2011). The North American Breeding Bird survey indicates that hairy woodpecker trends have been increasing since 1966 (BBS 2011).

The hairy woodpecker represents species dependent on snags, and is a mid-sized bird found from low- to high-elevation forest cover types. They nest and forage in mid- to large-sized snags and have been documented within the project area. The only species of woodpecker that is perhaps more common is the northern flicker. Nests can occur within short, small diameter snags, although like pileated woodpeckers, they often locate cavities near the tops of snags (Bull 1987; Thomas 1979). The landbird survey (Hutto and Young 2002) found hairy woodpeckers widely distributed across most forest community types.

Hairy woodpeckers are year-round resident primary cavity nesters, which subsequently provide nest cavities for myriad small birds and mammals. They reside in many forest communities and use a variety of tree sizes. They feed on insects, primarily ants, wood borers, and grubs as well as fruits and berries (Birds of North America 2011). Hairy woodpeckers forage on a variety of substrates, including snags and down woody debris (DWD) They may concentrate in areas of insect outbreaks in response to the increased food source (Sousa 1987). Territory size ranges from about 2.5 acres to 37 acres (Sousa 1987). Because of ongoing MPB epidemic, small to medium diameter snags are not limited in the project area.

Hairy Woodpecker Project Area Habitat and Documentation

Hairy woodpeckers have been documented across the project area and suitable habitat occurs on over 7,800 acres. Available habitat has increased since the MPB outbreak and suitable small-to medium-diameter snags are widespread and abundant (see table 80 under pileated woodpecker and figure 67). Both bird and nesting surveys were conducted in areas affected by MPB mortality in the Elkhorn Mountains in 2012, and compared with pre-outbreak surveys. Fifteen hairy woodpecker nests were monitored, including eight in ponderosa pine and seven in aspen. Forty percent of the nests in areas affected by MPB outbreak successfully fledged young. While the nest survival rate did not show a statistically significant response to the MPB outbreak, a higher nest survival rate trend was observed for the hairy and American three-toed woodpeckers during post-outbreak years (Dresser et al. 2012).

Assuming an average home range of 10 acres, the project area can potentially support a large number of nesting pairs.

American Marten

Methodology and Analysis

Analysis area documentation is based on the MHNP Database (2011) and the USDA Forest Service NRM Database (2011c). Habitat estimates are based on intensified grid data and information provided in Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher (Samson 2006b). Throughout most its distribution, American marten are reported to be closely associated with relatively closed canopies (greater than 30-50 percent) (Bushkirk and Ruggiero 1994) and in some areas may utilize areas with canopy cover greater than or equal to 25 percent (Chapin et al. 1997). For the purpose of this analysis, canopy cover greater than or equal to 25 percent is used to predict marten habitat.

Habitat models used in Samson (2006b) are described in the Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009b). Model values are based on R1-VMap values and include: dominant tree types Douglas-fir, ponderosa pine, Engelmann spruce, subalpine fir, lodgepole pine, and aspen as well as mixed stands that include these types, tree sizes greater than 10 inches diameter, and canopy cover greater than 25 percent.

The average territory ranges from 160 to 1,800 acres, so the project area is large enough to evaluate direct and indirect effects. However, because use of an area is largely determined by landscape-level influences (Powell et al. 2003), and considering the widespread MPB mortality and recent wildfires, the combined boundary is used to assess cumulative effects.

Species Status and Biology

Marten have a global rank of G5 and are considered common, widespread and abundant, although they may be rare in parts of their range. They are not vulnerable in most of their range (MNHP 2011). In Montana the marten has a status of S4, and although apparently secure, it may be declining and rare in parts of its range (MNHP 2011).

The American marten is identified as an indicator to monitor the quality of large continuous blocks of mature cover; although research has shown that they appear to be dependent primarily on mature forests with a relative abundance of large woody debris and an adequate distribution of standing snags (Ruggiero et al. 1994). Preference for mature forests is strongest during the winter. This may be related to snow depths and increased success of encountering and capturing prey (Thompson and Colgan 1994).

The American marten is associated with late-seral coniferous forest characterized by closed canopies, large trees, and abundant standing and downed woody material. Of particular importance is the quantity of downed debris on the forest floor as it provides protection from predators, access to the under snow environment for hunting and resting, and thermal protection from heat and cold (Ruggiero et al. 1994). Chapin et al. (1997) found that vertical and horizontal structure was more important than age or species composition, and Thompson and Colgan (1994) found higher densities of marten in unlogged forests versus logged forests possibly due to reduced predation. Thomson and Colgan (1994) hypothesized that martens do not necessarily avoid openings but are more vulnerable to larger predators when crossing openings. Thus, landscapes containing large, well-connected patches of mid- and late-seral forest are more likely to sustain higher numbers of martens than more fragmented or naturally-patchy lands.

Marten are primarily found in mid- to high-elevation forests with a strong component of subalpine fir, Engelmann spruce, and lodgepole pine with pockets of coarse woody debris. Marten are rare in lower elevation ponderosa pine and dry Douglas-fir forests (Buskirk and Ruggiero 1994), although these habitats sometimes provide linkage between forests suitable for long-term occupancy.

Research indicates that martens abandon, or fail to colonize home-range size landscapes with less than 60 percent mature forest (Powell et al. 2003), reinforcing other studies that indicate that martens avoid regenerating clearcuts for several decades. Managers should provide adequate densities of snags, large trees, and logs and provide large blocks of interconnected mature forest (Powell et al. 2003).

Marten population densities and trends are notoriously difficult to evaluate: long-term data sets are rare, and populations often fluctuate dramatically over short periods of time, in large part because of variable trapping pressure. Where reasonably accurate data have been obtained, population densities have been very low compared to most other mammals—generally in the range of 0.4 to 2.4 marten per km^2 (Buskirk and Ruggeiro 1994).The average territory size for marten varies from 160 acres (Kirk and Zielinski 2009) to 1,804 acres for transient males (Slough 1989). In addition, home range size varies by habitat quality and food availability, and in the northern Rockies, it is estimated that 1,920 acres are necessary to provide adequate habitat in years when food is scarce.

While marten and fisher have similar habitat requirements, marten are largely restricted to higher elevations, engage in more arboreal and subnivean activity (i.e., tunnels under snow), eat smaller prey, can forage in deep snow and are more strongly related with coniferous stands (Ruggiero et al. 1994).

American Martin Project Area Habitat and Documentation

Marten have been consistently observed to the west and north (MNHP 2011, USDA Forest Service 2011c) and a DNA hair sample was obtained from Stonewall face in 2011. There are also trapping records from upper elevation lands in the Stonewall Creek drainage (within the project area) and from the Copper Creek drainage in the combined area (MNHP 2013).

Mountain pine beetle mortality has altered potential habitat patterns for marten, particularly on lands with a large lodgepole component; whereas the increase in snags and downed wood benefit marten. Currently the project area contains approximately 6,800 acres of suitable marten habitat (28 percent of the project area). When viewed across the larger landscape (cumulative effect boundary), there is little marten habitat to the northwest of the project area, and generally the project area does not contain the landscape-level mature forest conditions preferred (Powell et al. 2003). While it is unlikely that the project area would be utilized for denning, and habitat conditions have been reduced, snag and CWD habitat are abundant and suitable marten habitat is present. Because marten are considered rare in lower-elevation ponderosa pine and dry, Douglas-fir forests (Buskirk and Ruggiero 1994), suitable habitat largely occurs at upper elevations in the project area.

Samson (2006b) determined that approximately 3,459 acres of habitat would maintain minimum viabable populations of martens in the Northern Region. Currently, based on FIA data, there are 293,064 acres of marten habitat on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Snowmobile use occurs throughout much of the lower elevations, primarily along groomed trails and roads, although some cross-country use in larger openings off-trails does occur. Use at higher elevations where marten would likely exist is primarily along designated trails.

Commonly Hunted Species

Elk

Methodology and Analysis Area

Elk serve as a management indicator for hunted species and management for elk requires meeting basic elk habitat requirements, including understanding the socioeconomic value of elk. Lonner (1991) identified the following primary considerations in elk management, (1) maintaining habitat security to protect elk during the hunting season, (2) preserving/recovering desired elk population characteristics as determined by elk managers and distribution relative to land management, and (3) satisfying the growing demand for quality hunting and non-hunting experiences. Several methodologies have been developed that measure elk vulnerability, or the relationship between elk, land management practices and the demand for elk hunting and non-hunting experiences. These methodologies are the focus of much of the analysis presented and include an assessment of summer range, security habitat and winter range.

Elk are evaluated in part by looking at three variables including summer range hiding cover, road densities during hunting season, and winter range thermal cover. The following is a summary of how Forest Plan standards relevant to elk management focus on these variables:

- **Summer Range Hiding Cover** – Forest Plan standard 3 addresses both summer and winter range. For the purpose of this analysis, the Montana Fish, Wildlife and Parks definition of hiding cover (a stand of coniferous trees having a crown closure of greater than 40 percent) is used with a minimum patch size of 40 acres. The 40 percent canopy cover metric is an acceptable ‘proxy’ for mapping hiding cover, as it is generally assumed that stands with 40 percent canopy cover or greater would in turn provide adequate vertical structure that would hide 90 percent of an elk at 200 feet, the functional definition of hiding cover (Black et al. 1976 p. 18). This relationship of canopy cover and stand structure is based on modeling done by Lonner and Cada (1982) and others (e.g., Leckenby et al. 1985, Thomas et al. 1988) who used canopy cover to predict the relationship between hiding cover (as estimated by canopy cover), road densities, and harvest rate the first week of the general hunting season. Hiding cover surveys in the project area have validated this relationship between canopy cover and functional hiding cover (See the Stonewall Elk Hiding Cover Synthesis/Management Area T2 and T3 Focus Report in the project record. See also the discussion in the Elk Amendment section.)

  Using this definition, the requirement for Forest Plan standard 3 is to maintain a minimum of 50 percent hiding cover within each herd unit (USDA Forest Service 1986 p. II/18).

- **Winter Range Thermal Cover** – Forest Plan standard 3 also requires that 25 percent of each herd unit winter range provide elk thermal cover. The Forest Plan defines thermal cover as a stand of coniferous trees 40 feet or more tall with an average crown closure of 70 percent or more, and a minimum size of 15 acres. Based on currently available vegetation mapping (VMap) this analysis uses stands 40 feet or taller with a canopy closure of 60 percent and a minimum size of 15 acres to describe thermal cover.

- **Road Density** – Forest Plan standard 4a addresses a road management program to improve big game security during the hunting season. This standard uses a hiding cover to open-road density within a herd unit during the October 15 to December 1 hunting period. The standard was intended to “provide for a first week bull harvest that does not exceed 40 percent of the total bull harvest…” (USDA 1986, pp. 11/7-18). When the Forest Plan was crafted, MFWP collected data to determine the percentage of bulls harvested during the first week of the general big game hunting season, as reflected in Standard 4(a). However, MFWP no longer collects that data. Rather, MFWP now relies on bull to cow ratios measured through aerial survey trend counts. These trends are used to determine and adjust harvest regulations that allow MFWP to achieve their elk population objectives (MFWP 2005). This analysis utilizes those bull to cow ratios set forth in the Elk Management Plan as a means of gauging the effects to big game security during the hunting season.

In addition to analyzing these parameters for compliance with Forest Plan standards 3 and 4a, two additional analysis tools are used to assess potential effects at the elk herd unit level: Habitat effectiveness and elk security. These methodologies do not constitute direction and do not replace existing Forest Plan standards. This is in keeping with the *Framework for Project-Level Effects Analysis on Elk* that states, "… this framework does not replace Forest Plan standards or pre-existing rights, nor does it give further definition to any current direction provided in the Custer, Gallatin, Helena or Lewis and Clark Forest Plans" (USDA Forest Service 2013 at 3). The following is a summary of each:

- **Habitat Effectiveness** – Habitat Effectiveness evaluates open road densities with respect to habitat use of summer range outside the big game season. Habitat Effectiveness is based on work conducted by Lyon (1979 and 1983) and is based on roads open to the public from May 16 to October 14. The Forest Plan does not include a specific threshold for habitat effectiveness.
- **Elk Security** – An elk security analysis is completed to address elk vulnerability during the hunting season. This analysis is based on the *Hillis Paradigm* (Hillis et al. 1991) as refined to reflect local knowledge of elk and their habitat use. Hillis et al. defined an elk security area as, "… a block of non-linear, mostly forested habitat at least 250 acres in size with all boundaries at least ½ mile from open roads." The Helena NF has modified this approach for more open east-side Forest habitats based on discussions between MFWP and the Helena NF, 2013-2014 (See MFWP and USDA 2013).The security definition used in this analysis is as follows: "The proportion of an elk herd unit within the administrative boundary of the Lincoln Ranger District that consists of an area of at least 1,000 acres in size that is at least ½ mile from a motorized route open to the public between 9/1 and 12/1." This definition does not rely on the availability of cover or on the presence of closed roads—two components of security discussed by Hillis et al. (1991). Although Hillis et al. (1991) define security as "non-linear blocks of hiding cover", they also suggest that effective security areas may consist of several different cover types if the block is relatively unfragmented. The studies considered by Hillis et al. (1991) were conducted in areas of contiguous forest cover.

  In contrast to the Hillis et al. (1991) study areas, the landscape on the Lincoln Ranger District tends to include both open and closed forested habitat, as well as areas where forests and grasslands are interspersed in a mosaic pattern. As such, consideration of the quantity and quality of forested cover across the entire EHU would be better than defining security areas as "blocks of hiding cover". This would allow for recognition of those situations where a mosaic of forest and open habitats exists, but which operationally are secure. In addition, recent analyses of elk habitat selection during the hunting season in Montana (Proffitt et al. 2013) did not show a significant selection for security areas comprised totally of coniferous cover. In addition, this analysis showed that security areas as a variable in habitat selection during the hunting season are strongly related to the motorized route variable.

  In their discussion of security areas, Christensen et al. (1993, pages 4-5) speak to the role of cover in this equation and note that where cover is ubiquitous, security can be controlled by road management alone. They recommend that in the more naturally open elk habitat in central Montana, cover considerations should extend beyond the hunting season and therefore be assessed at a landscape level, not necessarily at an elk-herd-unit scale (See also Edge et al. 1987). Their data advises "…elk are less selective about the specific vegetative characteristics of coniferous cover and more responsive to the size of units, connectiveness with adjacent units, and the scale of cover on the landscape" (Lyon and Canfield as cited in Christensen et al. 1993, page 5).

Lyon et al. (1985) discuss the role of cover in the context of open road densities during the hunting season. They suggest that where cover is poor (33 percent or less of an area) and road densities high, restrictions during the hunting season will minimize impacts to elk; conversely, if cover is good (at least 66 percent of an area) and road densities low, road restrictions may not be applicable (Lyon et al. 1985, pp. 8-9). They further describe that "[h]iding cover alone, however, is not necessarily secure, and several investigators…concluded that both topography and ***size of an undisturbed area*** can contribute to increase security" (emphasis added) (Ibid, p. 43).

Hillis et al. (1991) only speak to "open roads" and "closed roads". They suggest that hunting pressure is concentrated along open roads, but closed roads located within security areas may increase elk vulnerability by providing walking and shooting lanes. Unsworth and Kuck (1991) note that road closures may have varied effects on animal distribution and hunter use and success. They cite to several studies where road closures allowed elk to remain in more preferred sites for longer periods of time (Irwin and Peek 1979). Basile and Lonner (1979) reported that when vehicular travel was restricted, hunters spent more time walking, saw more elk and had greater success, and reported having a higher quality hunting experience. Based on these studies and the recent review from McCorquodale (2013) on elk and roads, the Hillis et al. recommendation to "minimize" closed roads within security areas was deemed unnecessary in the development of a security definition for the Lincoln Ranger District.

It is important to note that Hillis et al. (1991) emphasize "…strict adherence to the guidelines should be avoided." As part of public input on the Blackfoot Non-winter Travel Plan, the HNF received a letter from J. Lyon and M. Hillis [i.e., Lyon and Hillis 2013] relative to the application of the "Hillis Paradigm" in this project. That letter suggested that "…applying the paradigm to eastside forests with typical open forest cover types…would be imprudent without first doing some formal review with local biologists and researchers familiar with the unique harvest situations on the eastside." To that end, the security definition developed for the Travel Plan and used here was developed with MFWP local biologists and reflects the broader collaborations outlined in MFWP and USDA Forest Service (2013) to which Jack Lyon himself contributed.

While the security area analysis is not a Forest Plan requirement, and specific Forest Plan thresholds to be met are not established, it does consider distance from open roads and patch size, along with a recommended goal for the amount of security area within a herd unit.

The Stonewall project area is located in two elk herd units including Beaver Creek and Keep Cool. Because elk have a strong fidelity to specific areas, and considering elk use and numbers are determined largely by conditions specific to the Stonewall area such as proximity to wilderness, conditions resulting from the 2003 Snow Talon fire and dryer conditions that characterize National Forest and private lands, direct and indirect effects are evaluated by herd unit, by specific management areas, and across the project area as a whole (depending on the measures and effects discussed). Cumulative effects are also evaluated at the herd unit boundary.

Assumptions and Information Used

Elk documentation is based on field surveys and herd unit information provided by the Montana Fish, Wildlife and Parks (MFWP 2004) elk management plan, as well as by more recent assessment of herd conditions (Kolbe 2012). The Montana Fish Wildlife and Parks Elk Distribution GIS layer was used to identify summer and winter range within both project area herd units across all ownerships. All of the Beaver Creek-Lincoln and Keep Cool Creek HUs (76,730 acres) are considered elk summer range, while only a portion provides winter range. Elk hiding cover and thermal cover are derived from R1-VMAP, and are based in part on the "R1 Vegetation Council Classification Algorithms" (USDA Forest Service 2006a), and the "R1 Multi-level Vegetation Classification, Mapping, Inventory and Analysis System"

(USDA Forest Service 2007e). Forest Plan hiding and thermal cover calculations are based on R1-VMAP data and HNF wildlife models for this species (USDA Forest Service 2009a). While canopy cover has recently been reduced due to MPB mortality, standing dead trees continue to provide screening and some snow intercept properties, therefore, pre-kill canopy closure is used to identify Forest Plan thermal and hiding cover. Existing hiding cover was validated with field surveys, as described in the document “Stonewall Elk Hiding Cover Synthesis/Management Area T2 and T3 Focus” in the project record (USDA Forest Service 2015).

Road density information is derived from the HNF INFRA database and Montana’s roads database. For Open Road Density during the hunting season (Standard 4a), private roads are assumed to have less impact on elk than public roads. Rowland et al. (2000) examined the relationship between open, closed and administrative roads on elk habitat use. He found that administrative roads (restricted vehicle use, not open to the public) are similar to private roads as far as vehicle use, and open roads have the greatest impact on elk habitat use. Based on this and other research (Lyon 1979; Witmer and deCalesta 1985) this analysis assigns a weight of 0.25 to private and administrative roads. A value of 1.0 is assigned to open roads, which include all roads and motorized trails open to public use between May 16th and October 14th. The analysis for Standard 4a during project implementation includes those roads that are closed to the public that will be used for project activities. This is the same approach utilized for the habitat effectiveness analysis.

Elk Management Plan Summary

The Montana Elk Management Plan (2004) provides detailed information on the Elk Management Units (EMU) relative to goals, objectives, and management challenges. Hereafter, Elk Plan is used interchangeably with Montana Elk Management Plan (2005). The project area is located in Hunting District 281 of the Bob Marshall Wilderness Complex EMU and contains the Beaver Creek-Lincoln Herd Unit (HU) on the west and the Keep Cool Creek HU on the east. Approximately 94 percent of the project area herd units occur in Hunting District (HD) 281, which is the focus of the Stonewall elk population/habitat analysis. HD 284, which makes up approximately six percent of the project area herd units is an archery only zone along the Blackfoot River occurring entirely on State and private lands.

In parts of the EMU, including the Blackfoot Valley, excessive road densities were a concern in the 1992 Elk Plan (MFWP 2005). Currently, however, road closures due to endangered species management have reduced open road densities in most areas to the point where security for elk is no longer a significant concern (MFWP 2005). For HD 281 the Elk Plan notes that access to elk hunting is most significantly affected by the remote character of Lolo and Helena NF lands outside the wilderness boundary and walk-in hunting on heavily roaded Plum Creek Timber Company (PCT) and other private parties managed through the block management program (MFWP 2005). Hunting District 281 is one of three hunting districts supporting the largest amount of elk habitat on private land within the EMU. Within project area herd units approximately 65 percent of the HD 281 winter range occurs off NFS lands.

Hunting District 281 contain 127,781 acres of elk summer range and 101,591 acres of winter range. More than 80 percent of the elk observed in this EMU use Wilderness habitats during at least a portion of the year. Based on herd counts, the Elk Plan (2005, page 108) noted that elk populations wintering in HD 281 were near modern day highs. Of the approximately 650 post season wintering elk counted in HD 281 and 285, about 200 were counted in the Beaver Creek wintering area which is within the project area (MFWP 2005, Figure 3 page 109). Population objectives include maintaining 500 to 700 elk observed post-season, with 150 to 200 elk in the Beaver-Keep Cool area, and maintaining at least 15 bulls:100 cows or 8 percent bulls among total elk observed post-season (MFWP 2005 p. 119).

The overall objective for this EMU is to manage elk populations in a healthy condition at levels commensurate with available habitat in order to provide a variety of recreational experiences, including hunting and general enjoyment by the public. Specific habitat management strategies include; (1) use of natural and prescribed fire on wilderness and roadless public lands to improve elk habitat, (2) maintain elk habitat security and associated walk-in hunting opportunities (via enforcement of existing road closures and retention/recruitment of effective cover blocks in selected areas of HD 281 and 285, and 3) cooperate with other land managers in the development of integrated strategies to improve the prevention and control of nonnative invasive plants (NNIS) (MFWP 2005 pages 116-117).

Species Status and Project Area Habitat

Elk in Montana have a status of S5, and although rare in parts of its range, statewide they are considered common, widespread and abundant (MFWP 2011a). Elk are also considered habitat generalists that are mobile, adaptive and wide ranging. They occur in a variety of habitats ranging from high mountainous areas to highly managed forests to cold deserts (Skovlin et al. 2002).

The elk herd unit (76,731 acres in two herd units) is considered elk summer range, whereas winter range occurs on portions of the two herd units, approximately 31,540 acres or 41 percent of noth EHUs. The southern portion of the project area also provides transition range, or range between high elevation summer (National Forest) and low-elevation winter habitat (National Forest and Private/State).The project area contains approximately 28 percent of the total HD 281 winter range and 57 percent of the total HD 281 summer range.

Post-season surveys conducted by MFWP in 2014 observed 651 elk, and estimated 814 elk in the hunting district. There were 14 bulls per 100 cows observed (J. Kolbe, pers. comm. January 27, 2015). MFWP reports that in 2013, 64 elk were harvested from HD281, with bulls comprising 78 percent of the harvest and 40 percent of those bulls with 6 or more points (MFWP 2014, accessed online at http://fwp.mt.gov/hunting/planahunt/harvestReports.html). Overall numbers of elk are within Elk Plan objective (MFWP2005), although number of bulls is slightly low.

The following is a summary of key elk habitat components as they pertain to the Stonewall Project area.

Summer Range Hiding Cover

Summer range includes upper-elevation lands where elk typically migrate following snowmelt. All of the Beaver Creek-Lincoln and Keep Cool Cr. HU’s (76,730 acres) are considered elk summer range. Much of the summer use occurs on high elevation cool/moist areas, including wilderness lands to the north (HD 280). For example radio telemetry data indicates up to 50% of elk wintering in HD 281 migrate into HD 280 in early summer and accomplish the reverse migration in early winter (MFWP 2005). Some research indicates that the quality of summer range is one of the more important variables when determining annual variation in herd growth. The quality of summer range is measured in terms of percent of hiding cover on summer range and habitat effectiveness, which is a measurement of open road densities during the summer.

Decades of fire suppression have resulted in closed-canopy conditions that have increased elk cover across the project area, although this has been reduced somewhat due to recent MPB mortality. Hiding cover has been further reduced due to wildfires in the last 10 years. While elk hiding cover has been reduced in both herd units, hiding cover within the project area and National Forest System lands is more widespread. Future hiding cover is expected to decline as standing dead trees (due to MPB mortality) fall to the ground.

As described above, hiding cover is based on the MFWP definition and includes forested stands that have 40 percent or more canopy cover and are at least 40 acres in size. Using this definition, Forest Plan standard 3 requires that hiding cover be maintained on a minimum of 50 percent of each HU. The amount of hiding provided on each HU and whether they comply with Plan standard 3 is displayed in

Table 81. Forest Plan hiding cover on elk summer range

Elk Herd Unit	Summer Range Acres	Forest Plan Hiding Cover	Percent Plan Hiding Cover	Meets Plan Standard #3
Beaver Creek	32,406	18,183	56	Yes
Keep Cool Creek	44,325	15,607	35	No

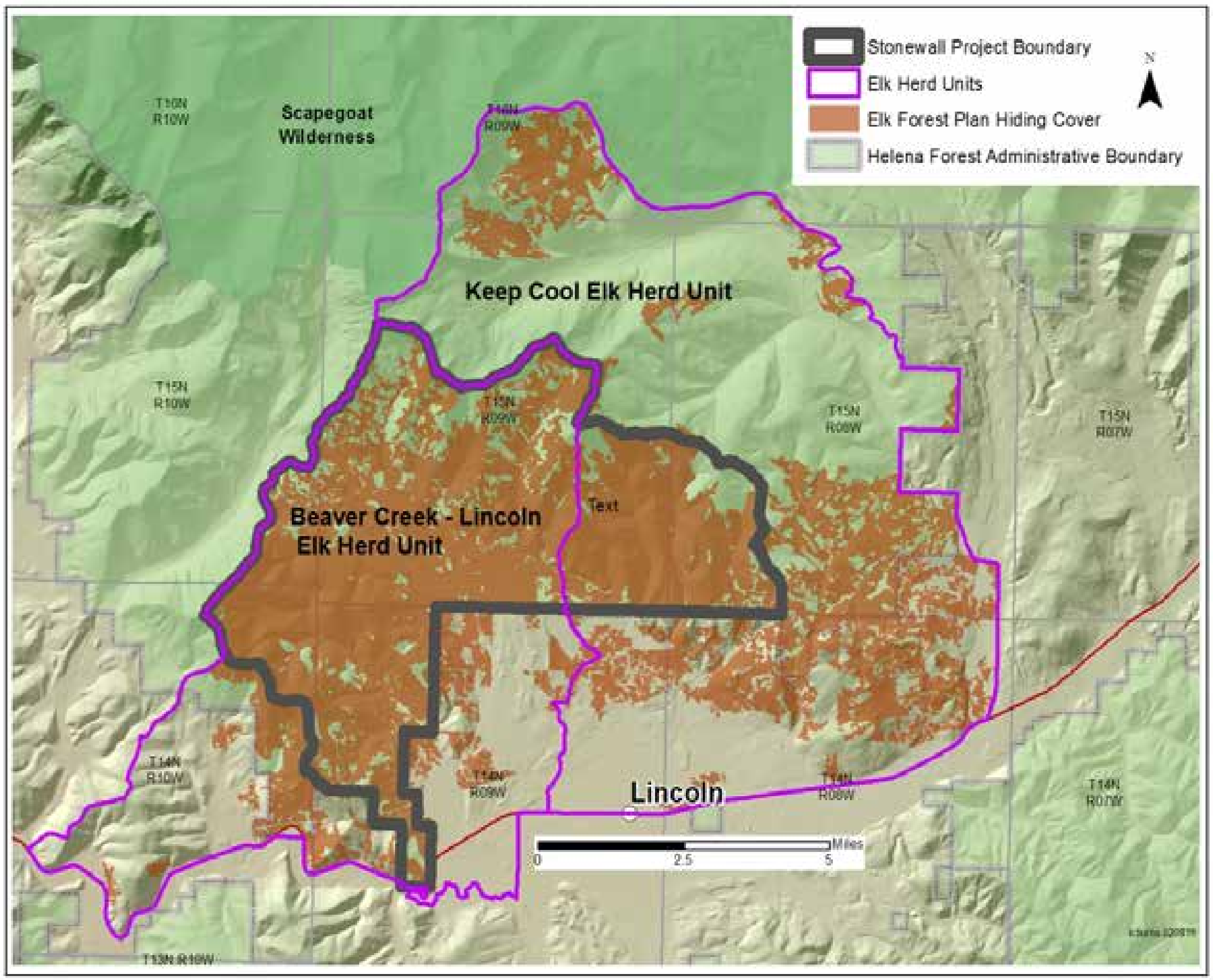


Figure 75. Existing hiding cover in Beaver Creek and Keep Cool herd unit

As can be seen from figure 75, the Stonewall Project area contains a disproportionate amount of hiding cover when compared to the herd units as a whole, and 86 percent of the existing hiding cover in the Beaver Creek HU and 67 percent in the Keep Cool Creek HU occur on National Forest System lands. Consequently elk hiding cover on NFS land is higher than is indicated in table 81, and is currently well distributed on NFS lands.

Summer Range Habitat Effectiveness

Elk generally avoid human disturbance and/or exhibit physiological stress when exposed to human activity (Cassirer et al. 1992). Habitat effectiveness refers to the percentage of available habitat that is useable by elk outside the hunting season (Lyon and Christensen 1992). This analysis incorporates the habitat effectiveness model developed by Lyon (1983) based upon road densities. Christensen (et al. 1993) described Lyon's model for defining elk habitat effectiveness and comparing differences between alternatives.

Christensen (et al. 1993) recommended that habitat effectiveness should be 70 percent or greater (open road density less than 0.7 miles per square mile) for areas intended to benefit elk summer habitat and retain high use. Areas where elk are one of the primary resource consideration should have habitat effectiveness of 50 percent or greater (open road density of 1.9 miles per square mile or less). Areas with less than 50 percent habitat effectiveness (greater than 1.9 miles per square mile of open road density) are expected to make only minimal contributions to elk management goals.

Habitat effectiveness considers the open road density for roads open to motorized use between May 16 and October 14. Table 82 displays the existing open road density for EHUs. Road densities are determined across the entire herd unit including private lands and associated roads. Habitat effectiveness is currently below 50 percent in both the Beaver Creek and Keep Cool Creek HUs

Table 82. Elk herd unit summer open road density

Elk Herd Unit	Square Miles	Open Road Miles	Open Road Density	Percent Habitat Effectiveness
Beaver Creek	51	159.9	3.2	<50
Keep Cool Creek	69	189.6	2.7	<50

Winter Range Thermal Cover

Winter range is an important element of elk habitat. Areas with minimal human activities and adequate forage reduce the energetic costs associated with overwinter survival. During the winter, snow and cold temperatures push elk onto low elevation habitats, with predominantly southern or western aspects. Elk have a strong fidelity to a given winter range with most cows returning year after year to the same general area.

The Forest Plan requires that thermal cover be provided on 25 percent or more of each elk herd unit's winter range. Existing winter range thermal cover is displayed in table 83 and figure 76.

Table 83. Forest Plan thermal cover on elk winter ranges[1]

Elk Herd Unit	Total EHU Acres	Winter Range Acres	Plan Thermal Cover Acres	Percent Plan Thermal Cover
Beaver Creek	32,406	17,787	938	5.3
Keep Cool Creek	44,325	13,754	527	3.8

[1] Winter range thermal cover

Most of summering elk winter on private/state lands outside the project area and utilize adjacent lower elevation National Forest System Lands. Elk winter range occurs on 55 and 31 percent of the Beaver Creek and Keep Cool Creek HUs, respectively. Because these lower elevation lands contain dry site coniferous forest and non-forest or open canopy forest on private land, currently thermal cover within both herd units is low, and neither herd unit complies with Forest Plan direction of maintaining of 25 percent of the winter range in thermal cover.

Thermal cover, as defined by the Forest Plan, is very limited in both abundance and distribution (see figure 76). Recent research indicates that classic thermal cover (conifer stands more than 40 feet tall with canopy closure of at least 70 %) is probably of little value to wintering elk except in extreme conditions (Cook et al. 1998, p. 41-48). This is due to the fact that elk are better able to maintain body condition by taking advantage of solar radiation in open habitats. In addition, recent studies on Montana winter range indicate that, when in forest habitats, elk often prefer stands with more open or patchy canopies capable of supporting suitable forage (Thompson et al. 2005, MFWP 2011b.

Definitions for elk thermal cover (Thomas 1979) are based upon what elk were assumed to prefer in the mid-1970s in northeast Oregon. Also preferred winter range cover conditions vary geographically (e.g., wintering deer and elk selected for dense mature forest on the Flathead National Forest which receives greater snow depths, whereas elk selected for open forests and shrublands on the Lolo National Forest which were found to have lower snow depths). Forage availability also varied. Forage productivity was substantially below the range of historic conditions on the Lolo due to the lack of disturbance (i.e. had missed several fire return intervals), whereas forage production was within the range of historic conditions on the Flathead, because it contained moist sites with long fire return intervals (MFWP 2011b).

Big game winter range conditions within the project area are characterized by dryer site conditions that have missed several fire return intervals (Amell and Klug 2015, Buhl 2015) and are less likely to support dense stands of thermal cover. Also winter range snow depths are lower than many other winter ranges found in the State (e.g. Flathead NF) with an average winter precipitation of 2.7 inches, and range of 1.9 to 3.9 inches (NRCS 2013). As a result, project area winter range conditions more closely resemble those found on the Lolo NF, where elk utilized both open canopy (25 to 40 percent canopy closure) and closed canopy (i.e. greater than 40 percent canopy closure) forest (MFWP 2011b). So while the Forest Plan thermal cover is not being met, winter range conditions are considered adequate to support local populations of elk, as is indicated by the fact elk numbers have increased over time (MFWP 2005) and population numbers are at objective in Hunting District 281(MFWP - Elk Objective Status 2014, accessed online at http://fwp.mt.gov/fishAndWildlife/management/elk/).

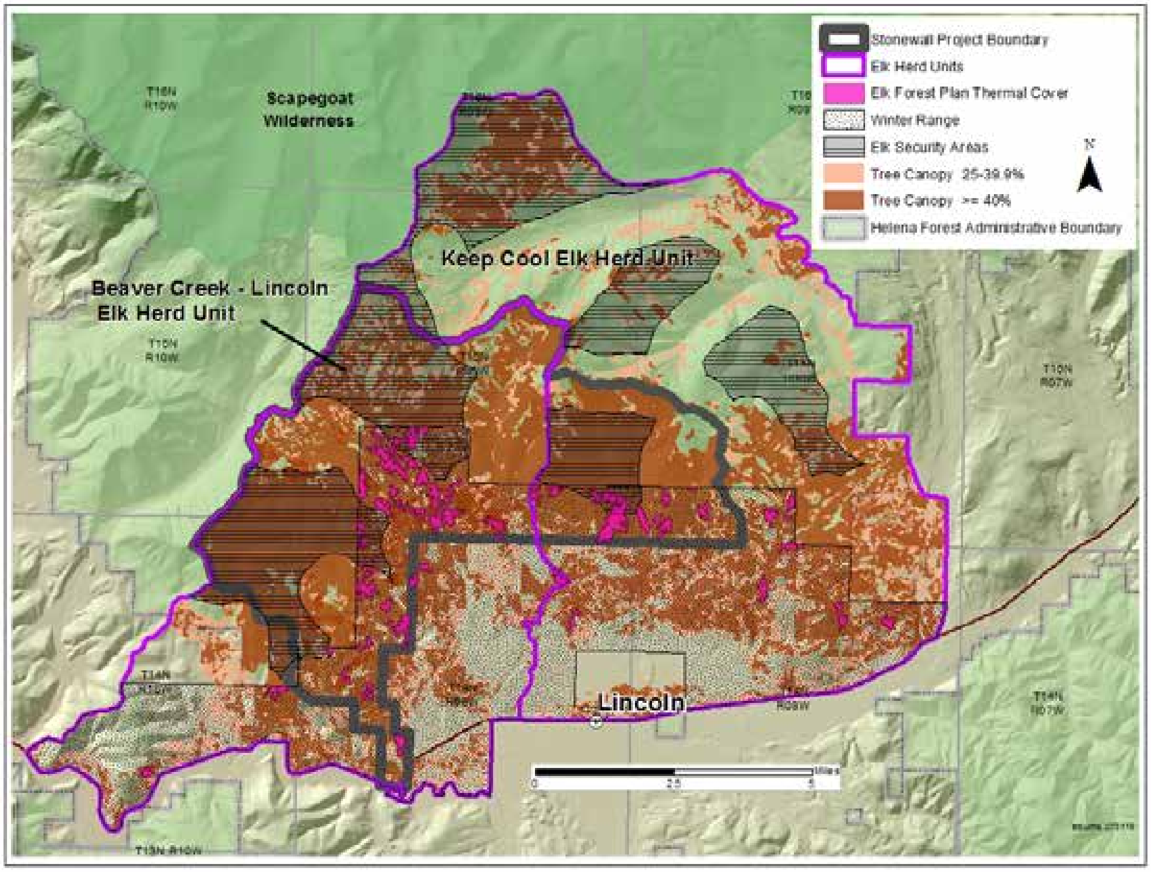


Figure 76. Elk winter range, thermal cover and security habitat

Open Road Density (Hunting Season)

The following addresses Forest Plan Standard 4a. For purposes of this analysis, Standard 4a is addressed as Open Road Density to avoid confusion with the Hillis et al. (1991) as modified security methodology, which is also used in this analysis and addressed as elk security.

During hunting season, management of elk includes balancing the need to provide for and protect certain sex and age classes of elk and to provide hunting opportunities. While these parameters are a management function of the Montana Fish, Wildlife and Parks, the Helena National Forest strives to compliment these objectives through management of open road densities. Table 84 summarizes the Forest Plan standards based on the MFWP definitions and thresholds discussed above which are used in this analysis. Table 85 summarizes the amount of Forest Plan hiding cover by elk HU, associated road densities during the hunting season, and whether the current conditions meet the Forest Plan standards for hiding cover/open road densities (Plan Standard 4a).

Table 84. Forest Plan hiding cover/open road densities (Forest Plan Standard 4a)

Existing Percent Hiding cover[1](according to MFWP definition of hiding cover)	Max Open Road Density
80	2.4 mi/mi^2
70	1.9 mi/mi^2
60	1.2 mi/mi^2

Existing Percent Hiding cover[1] (according to MFWP definition of hiding cover)	Max Open Road Density
50	0.1 mi/mi^2

Table 85. Elk herd unit data comparing hiding cover and open road density

Elk Herd Unit	Percent Plan Hiding Cover[1]	Total Square Miles	Open Road Miles[2]	Open Road Density
Beaver Creek	56	51	72.3	1.4
Keep Cool Creek	35	69	90.7	1.3

1 – From Table 81
2 – Open roads during the hunting season

As shown in table 85, neither project area herd unit meets Forest Plan Standard 4(a), although it should be noted that even if all the roads in the Beaver Creek HU and over 50 percent of the roads in the Keep Cool Creek HU were closed, the low hiding cover values (described under summer range) would preclude the HU's from meeting Plan standard 4(a).

Hunting Season Elk Security

The relationship between open road densities and hiding cover serves as the basis for the Forest Plan standard 4(a), and while this relationship is important, it does not take into account the spatial arrangement and size of unroaded patches, weather driven road access, or foraging condition during any given autumn. Additionally it is not necessarily an accurate predictor of elk security during the hunting season. Conversely, stands that may not meet the definition of hiding cover may well prove to be secure areas for elk, given local conditions of topography, remoteness and vegetation structure (i.e. a heavy downfall) that make hunter access more difficult. Therefore hiding cover alone is not synonymous with security (Lyon and Canfield 1991, Unsworth and Kuck 1991, Lyon and Christenson 1992 and Christenson et al. 1993).

Security and vulnerability are often used interchangeably but actually reflect a causal relationship: when security is high vulnerability tends to be low, and vice-versa. Elk vulnerability to hunting results from an extremely complex relationship involving access, cover, topography, hunter density and weather (Christensen 1993). Security is the result of a combination of factors that allow elk to remain in the specific area while under stress from hunting. More specifically these are areas of coniferous cover large enough and far enough away from open roads to provide security. The "Hillis (1991) paradigm" provides these and can be used as a general guide (Christensen 1993). Hillis et al. (1991) concluded that maintaining greater than 30 percent of each herd unit as security areas with a minimum patch size of 250 acres and at least 0.5 miles from open roads (areas where elk can evade hunters), would slow the elk harvest rate and increase the probability that some bulls would be available for harvest even late in the season. Hillis et al. (1991) acknowledged that their model was most applicable on densely forested areas with steep topography and might be less applicable on more open forests. Christensen et al. (1993) suggests that roads more than any other factor affect hunting opportunity, suggesting the Hillis et al. (1991) model might be conservative. Also Burcham et al. (1999) concluded that where posted private lands occur within a herd unit, many elk may move to private land during the hunting season in spite of there being large blocks of security on public lands.

Elk vulnerability during the hunting season for this analysis is defined as the proportion of an elk herd unit within the administrative boundary of the Lincoln Ranger District that consists of an area of at least 1,000 acres in size that is at least 0.50 mile from a motorized route open to the public between 9/1 and

12/1 (described above), and table 86 displays security on lands greater than 1,000 acres that are further than 0.50 mile from an open road for the two project area herd units. Existing security habitat is displayed in figure 76.

Table 86. Existing elk security within that portion of the elk herd unit within the administrative boundary

Elk Herd Unit	Total Acres within the Administrative Boundary	Security Acres	
Beaver Creek	19,987	8,144	41%
Keep Cool	30,478	10,929	36%

Forage

As described in the habitat section (section 3.1), decades of fire suppression and conifer encroachment has reduced shrub and herbaceous vegetation, as well as mountain meadow habitat and aspen. Collectively this has resulted in a reduction in elk forage within both herd units. While lands burned in the Snow Talon and more recent wildfires have increased available forage, elk use in these areas is reduced due to the large reduction in cover. While available forage in these areas would continue to increase, very little transition habitat and winter range has been affected by recent fires. As a result, forage availability in these areas remains low and is expected to continue to decline.

Calving Areas/Transition Range

Although elk calving is known to occur within the project area there are no specific calving grounds or nursery areas identified within the project area. Suitable birthing areas are broadly distributed primarily at upper elevations within the project area. Although elk calving usually occurs on spring/autumn transitional ranges, it also occurs on upper reaches of winter range or on lower summer range (Toweill and Thomas 2002). In general, calving habitat depends largely on the availability of succulent and nutritious vegetation during the month long calving season (mid-May through mid-June). This in turn is related directly to the receding snowline and plant phenology as well cover and predator avoidance.

While different studies have shown variability in what constitutes elk calving habitat, other factors such as predation can influence behavioral patterns by elk including annual variability in calving sites. In recent years the return of wolves to the ecosystem has forced elk to change how they utilize the habitats available to them. Between 2007 and 2012 the wolf population in the area, and throughout much of western Montana (Bradley et al. 2013), expanded rapidly due to the abundance of prey and the prey's unfamiliarity with the predator. In response elk have changed their behavior patterns and habitat selection to reduce the risk of predation by wolves which has also likely influenced variability in calving site selection. For the past several years there have been two known wolf packs with territories overlapping the project area. Due to the continued presence of wolves in the project area it is anticipated that elk calving site selection within the project area will vary over time in response to wolf predation.

Transition range is used by elk when migrating between summer and winter range, and is commonly made up of habitats such as Douglas-fir, aspen/pine, and other communities intermixed with grassland or shrub communities. These transitional range habitats provide forage needed by elk to build fat reserves in the fall and to support calving in the spring. If winter range forage quality is typically poor, transitional range can be extremely important in sustaining elk populations (NRCS 1999). Project area transition range occurs largely on mid-elevations habitats or generally mid- to upper-elevation elk winter range.

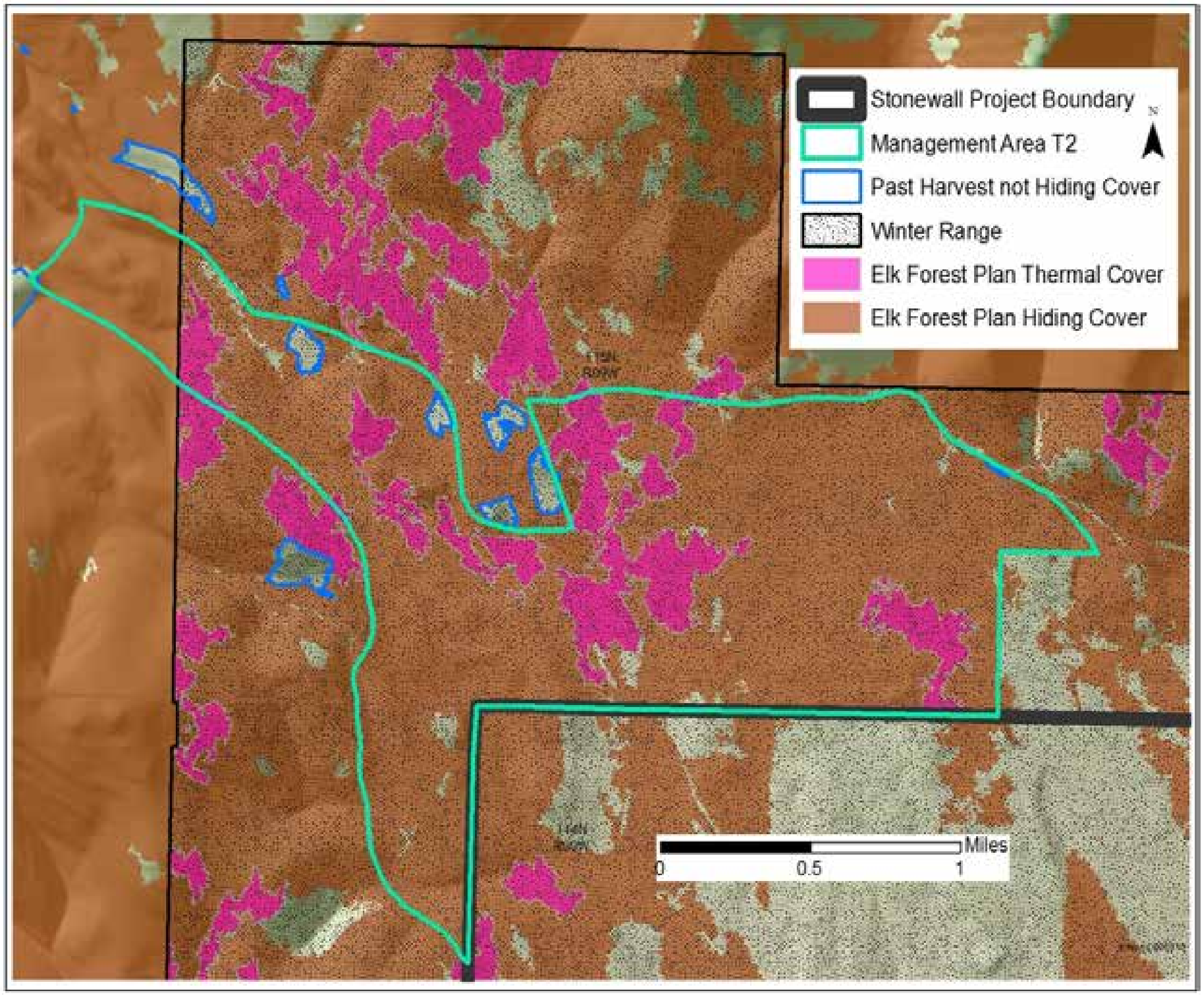


Figure 77. Management Area T-2: hiding cover, thermal cover on winter range; past harvest units not currently meeting hiding cover requirements

Management Areas

There are six management areas within the project area; of those, the Stonewall project contains three that have direction and standards relevant to elk habitat:

Management Area T-2

There are 2,184 acres of management area (MA) T-2 in the Beaver Creek herd unit (figure 77), of which 1,655 acres are within the project boundary. Forest plan standards for wildlife in this MA include:

- Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat.
- Maintain adequate thermal cover and hiding cover adjacent to forage areas. Generally this means providing 25 percent thermal cover on identified winter range.
- Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested.

- Schedule sale activities outside winter periods (December 1 to May 15).
- No more than 25 percent of the timber-perimeter around natural or artificial parks should be nonthermal cover at one time.

Elk hiding cover is provided on 1,608 acres or 97 percent of MA T-2. There are 2,083 acres of elk winter range in MA T-2 in the Beaver Creek herd unit, of which 1,559 acres are within the project boundary (within winter range). There are 276 acres or 13 percent in thermal cover in winter range in MA T-2 within the Beaver Creek herd unit, and 251 acres of thermal cover within winter range in the project area (16%). The MA is currently below the thermal cover standard on winter range. There are several openings created by timber harvest within this MA that do not meet the hiding cover requirements of big game. These are displayed in figure 77. There are no natural or artificial parks within the MA T-2 area.

Management Area T-3

There are 12,167 acres of MA T-3 in the Stonewall project area, in both the Beaver Creek and Keep Cool Creek HUs (figure 78). Forest plan standards for wildlife in this MA include:

- Wildlife habitat improvement practices, including road management, prescribed fire, and timber harvest, may be used to maintain and/or enhance the quality of big game summer habitat.
- Maintain a minimum of 50 percent hiding cover for big game, as determined by MFWP definition of hiding cover.
- Maintain thermal cover adjacent to forage areas. Appendix C provides guidance for thermal cover.
- Opeings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.

Hiding cover is found on 5,159 acres, or 91 percent of MA T-3. This is below the standard. There are several openings created by timber harvest within this MA that do not meet the hiding cover requirements of big game displayed in figure 78.

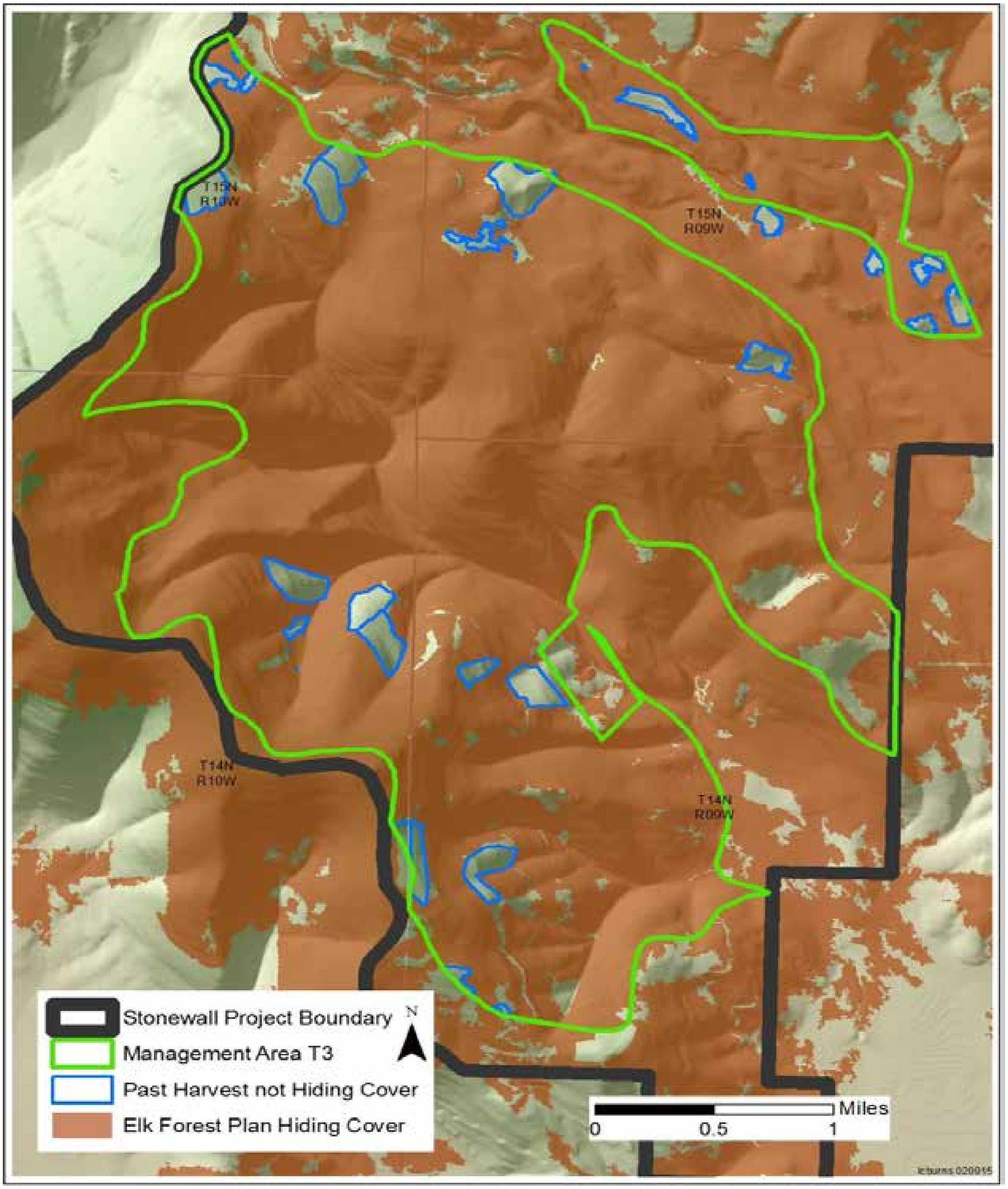


Figure 78. Management Area T-3: hiding cover and past harvest units not currently meeting hiding cover requirements

Management Area W-1

Management area W-1 is found on 4,685 acres of the Stonewall project area (figure 79). Forest plan standards for wildlife in this MA include:

- Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game and nongame habitat.
- Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing 25 percent cover, where available, on identified winter range.

There are a total of 3,452 acres (74 percent) of hiding cover in MA W-1. Winter range accounts for 198 acres of the MA, with 43 acres (22 percent) providing thermal cover; therefore the thermal cover standard is not met in the MA.

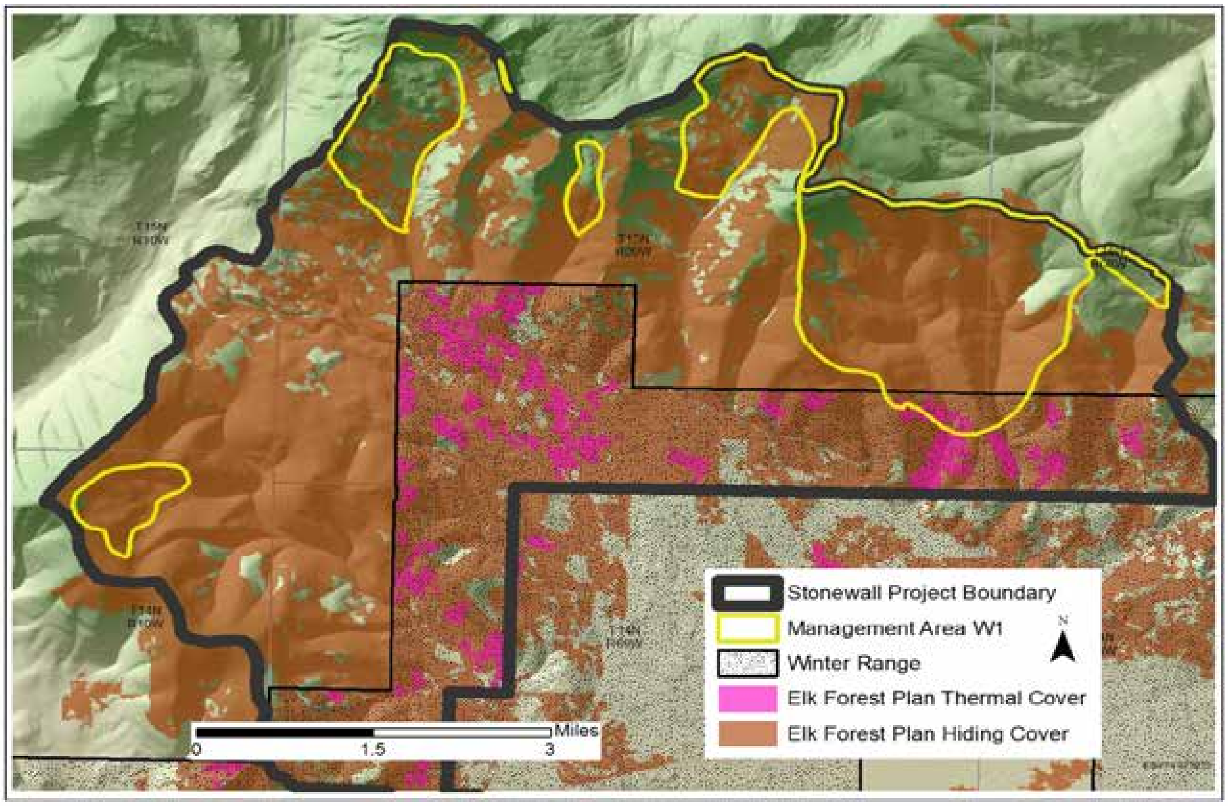


Figure 79. Management Area W-1: hiding cover and thermal cover on winter range

Mule Deer

Methodology and Analysis Area

Due to the variety of forest and nonforest communities utilized, virtually all of the Stonewall Project area provides suitable deer habitat. Like elk, effects are analyzed by looking at changes in cover and forage conditions on summer, winter and transition range and available mule deer cover is expected to be similar to that described for elk. Mule deer winter range and season-long use areas is based on MFWP range maps. Hiding and thermal cover models are based on R1-VMap data, whereas hiding and thermal cover models are described in the Criteria for Wildlife Models Helena National Forest Version June 2009 (USDA Forest Service 2009b).

Suitable habitat and use by deer is widespread. In Montana the average deer home range is less than 500 acres (Riley and Dodd 1984). As a result, and considering the project area contains year-round, winter and transition range, direct, indirect and cumulative effects are evaluated across the project area.

Species Status and Biology

Mule deer have a global ranking of G5 and a Statewide ranking of S5, indicating they are common, widespread and abundant. Although they may be rare in parts of their range, mule deer are not considered vulnerable (MNHP 2011).

Mule deer are habitat generalists, mobile, adaptive and wide ranging. As a result they use a wide variety of habitats from open to dense montane and subalpine coniferous forests, aspen, shrub communities and brushy areas. In summer they are widely distributed in forest and subalpine habitats, and in winter use lower-elevation, open, shrub-dominated areas (MNHP 2011). Within woody vegetation types, mule deer use all seral stages and do best in areas where there is a mix of seral communities.

Food habitats vary seasonally and by year. Preferred forage species include bitterbrush, mountain mahogany, chokecherry, serviceberry, grasses and forbs. Forbs are most important in summer, whereas shrubs are used year-round but are important in fall, winter and spring (MNHP 2011). Competition with elk can be significant because elk have a more varied diet and on shared range, mule deer are most often negatively impacted (MNHP 2011; Frisina et al. 2006).

Optimum deer habitat contains a mixture of forage and cover habitat that is well interspersed and generally, a mixture of 40 percent cover and 60 percent forage is considered optimum (Thomas 1979; Knight 2011). Available cover should include a combination of hiding, thermal and fawn rearing cover. Because deer cover and forage requirements are very similar to elk, the discussion of preferred hiding cover and forage for elk, would also apply to mule deer. Since deer are smaller, the height and density of vegetation suitable for cover (hiding and thermal) would be less than that required by elk (Thomas 1979). Also like elk, deer require water (particularly on summer range) (Julander 1966 *in* Thomas 1979) and optimum habitat occurs within approximately 0.5 mile of water (Mackie 1970 *in* Thomas 1979). Consequently riparian areas can be particularly important.

Fawning habitat for mule deer consists of foraging areas with hiding and thermal cover, and is typically on spring transition range with gentle slopes with abundant succulent vegetation within 600 feet of water. While many habitats are used for fawning and rearing fawns, those providing relatively large quantities of herbaceous vegetation are most important.

While deer numbers and herd health are affected by a number of factors, forage is often most limiting on carrying capacity (Knight 2011), particularly on winter range. Equally important to forage quantity is forage quality and reproduction and animal condition is best maintained if high quality (i.e., nutritious and palatable) forage is available. As a result, a combination of herbaceous and woody vegetation needs to be available.

Mule deer occupy nearly all habitats of the Lincoln Ranger District at nearly all elevations during summer and fall, although they are most abundant where large quantities of nutritious forage is available. Transition range is found at the lower elevations of the summer range and contains abundant grass and forbs, intermixed with the shrub and aspen communities.

Major impacts to mule deer habitat in northern forests include: (1) modification of vegetative structure, (2) decrease in nutritional quality of woody shrubs as they age, (3) modification of vegetation species composition, and (4) loss of usable habitat due to human encroachment and associated activities (Hayden et al. 2008).

Mule deer in Montana have a history of population fluctuations (see figure 80). These fluctuations vary among populations in response to environmental conditions and may reflect general, long-term changes in distribution and demographics, periodic fluctuations, year to year fluctuations, and season to season changes within years (Mackie et al. 1998 p. 110).

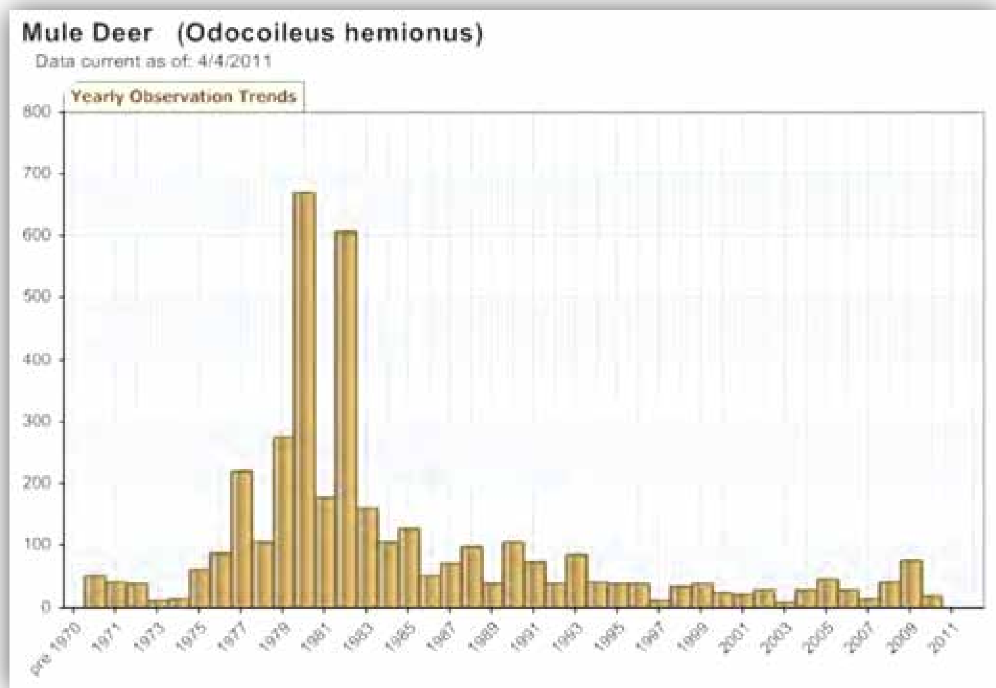


Figure 80. Mule Deer Fluctuations in Montana from 1970 to 2011 (Montana Field Guide)

Mule Deer Project Area Habitat

The project area includes a mixture of mature and regenerating forest interspersed with nonforest (on NFS and adjacent private lands), therefore, all of the project area provides deer habitat. Spring, summer and fall range occur on approximately 85 percent of the project area, although some of this is also utilized in the winter, whereas winter/yearlong range occurs on approximately 15 percent (MDFWP 2005-GIS distribution layer). While canopy cover has been reduced due to recent MPB mortality, like elk, standing dead trees continue to provide hiding cover. As a result cover is widespread and approximately 80 percent of the project area contains hiding cover (See figure 81). Of this over 99 percent is on NFS lands. The availability of thermal cover is reduced due to the more open ponderosa pine stands occurring at lower elevations. Also, while pre-kill data is used to identify existing thermal cover, cover in areas with concentrated mortality would be expected to decline in the next 10 years as mortality continues and trees fall to the ground. Currently, thermal cover exists on 492 acres or 14 percent of the project area mule deer winter range (See figure 81).

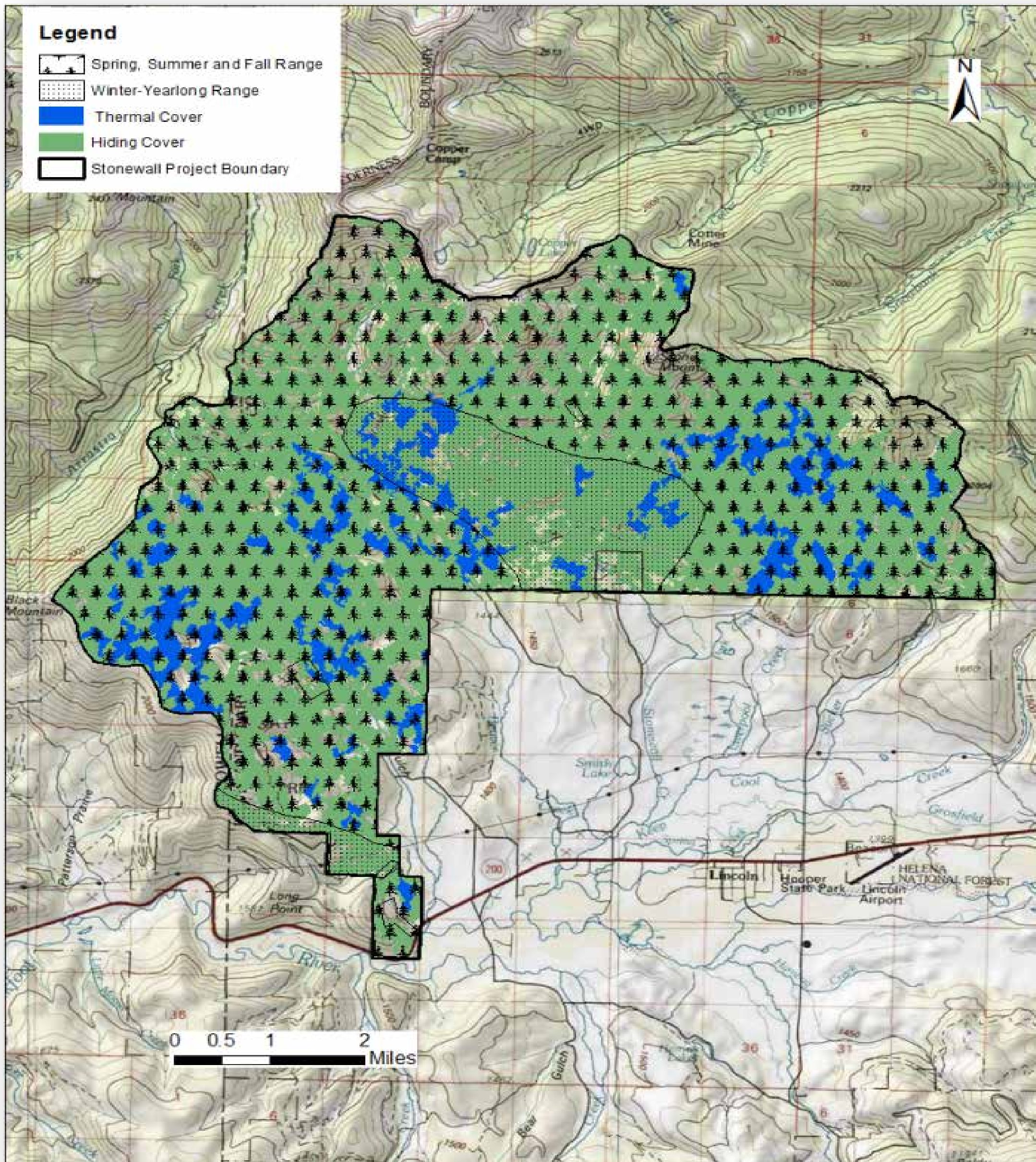


Figure 81. Mule deer range and cover within the project area

While there has been very little regeneration harvest in the last 15 years, some regenerated stands, particularly at lower elevations still contain higher quantities of deer forage, although early successional forage would continue to decline. Overall, due to fire suppression increasing stand density and conifer encroachment, aspen as well as understory diversity (grasses, forbs and shrubs) have been declining within forested stands. Conifer encroachment has also reduced shrub and herbaceous diversity in nonforest habitats. Finally in the absence of fire, there is little shrub regeneration and many existing shrubs, particularly on transition and winter ranges are becoming decadent. Collectively these conditions have contributed to a reduction in forage across much of the project area. Conversely, forage has increased on approximately 365 acres that recently (since 2003) burned by wildfire. Forage would also increase over time in areas where MPB have opened up the forest canopy, although conifer encroachment and elevated levels of downed woody debris may reduce the availability of forage for deer (Hayden et al. 2008).

In summary, while deer hiding cover is widespread due to the more open stand conditions that exist and MPB mortality, thermal cover within deer winter ranges is presently low and would continue to decline. While forage availability has been improved on summer range affected by wildfire, forage on winter and transition range, as well as most of the summer range has been reduced due to increased conifer encroachment and the absence of fire.

Migratory Birds

Methodology and Analysis Area

Migratory birds use diverse habitat conditions; therefore, existing habitat and environmental effects are primarily addressed in the assessment of the habitat conditions under the biophysical settings discussed in section 3.1. Additionally the bald eagle, black-backed woodpecker, flammulated owl, northern goshawk, and pileated woodpecker are priority I and II species in Montana; and the needs of migratory birds are also addressed in the analysis provided for these species. As a result, migratory birds are collectively addressed through the habitat and species-specific sections of this document.

While the analysis areas vary somewhat by species, generally, because bird use is determined by both site-specific and landscape considerations, direct and indirect effects to migratory birds are evaluated across the project area, whereas cumulative effects are evaluated across the combined boundary.

Migratory Bird Treaty Act

In December 2008, the Forest Service entered into a memorandum of understanding (MOU) with the United States Department of Interior (USDI) Fish and Wildlife Service on the Migratory Bird Treaty Act to further clarify agency responsibilities (USDA Forest Service and USDI Fish and Wildlife Service 2008). Four key principles embodied in the MOU direct the Forest Service to (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Migratory birds are included under the Migratory Bird Treaty Act (MBTA) and incorporate most species of birds present in the project area. Executive Order 13186 directs departments and agencies to take certain actions to further implement the MBTA. Specifically, the Order directs federal agencies, whose direct activities will likely result in the “take” of migratory birds, to develop and implement a memorandum of understanding with the U.S. Fish and Wildlife Service that shall promote the conservation of bird populations. Under Executive Order 13186, the U.S. Fish and Wildlife Service is responsible to ensure that environmental analyses of federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

In general, most birds migrate to some degree, including seasonal movements from higher to lower elevations within the same geographic region. The three most referenced groups of migratory birds are waterfowl, raptors, and neo-tropical migrants. Birds protected under the act include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows and others, including their body parts (feathers, plumes etc.), nests, and eggs. A complete list of protected species is found at 50 CFR 10.13.

Project Level Migratory Birds

The Helena National Forest has participated in the Region One Landbird Monitoring Program in partnership with the Avian Science Center (ASC) at the University of Montana. Habitat and distribution surveys have been conducted for landbirds from 1994- 2008. The USFS Northern Region Songbird Monitoring Program (Hutto and Young 2002) has provided data on population trends, habitat relationships, and effects from past management activities for birds breeding in western Montana. According to Hutto, "There are not nearly enough years of data to make meaningful use of our population trend data yet, but the preliminary data suggest that most populations have remained fairly stable during the 12-year period from 1994-2006" (See http://avianscience.dbs.umt.edu/projects/trends.php).

The project area contains three bird point count transects that were monitored from 1994-2004. Over 1,000 bird observations were made during this period. Table 87 identifies those birds identified as part of the Landbird Monitoring Program, the number of observations and preferred habitat. As described previously, migratory birds are also addressed through the habitat analysis presented.

Table 87. Project area migratory birds

Bird Species[1]	Habitat	Bird Species[1]	Habitat
American Crow (4)	Open Lands	Mountain Bluebird (3)	Grassland/Shrub
American Dipper(4)	Riparian	Mountain Chickadee (56)	Dry Forest
American Goldfinch (1)	Grassland/Shrub	Northern Flicker (22)	Snags
American Robin (54)	Generalist	Olive-sided Flycatcher (1)	Cool Moist Forest
Bank Swallow (1)	Riparian	Orange crowned Warbler (1)	Riparian
Barred Owl (1)	Cool Moist Forest	Osprey (1)	Riparian/Open Water
Black-capped Chickadee (1)	Dry Forest	Pileated Woodpecker (3)	Snags
Brown headed cowbird (12)	Forest Edge	Pine Siskin (94)	Dry Forest
Brown Creeper (1)	Dry Forest	Red-breasted Nuthatch (49)	Snags/Forest
Canada Goose (1)	Riparian/Open Water	Red-winged Blackbird (9)	Riparian
Cassin's Vireo (5)	Dry Forest	Red-naped Sapsucker (3)	Snags/Riparian Forest
Chipping Sparrow (27)	Dry Forest	Ruby Crowned Kinglet (130)	Dry Forest
Clark's Nutcracker (7)	Dry Forest	Ruffed Grouse (14)	Young Forest
Common Nighthawk (1)	Dry Forest	Song Sparrow (17)	Riparian
Common Raven (42)	Generalist	Swainson's Thrush (24)	Dry and Cool Forest
Common Yellowthroat (22)	Riparian	Towensend's Warbler (52)	Dry and Cool Forest
Dark-eyed Junco (103)	Generalist	Tree Swallow (7)	Grassland/Edge
Dusky Flycatcher (15)	Dry Forest	Varied Thrush (18)	Dry and Cool Forest
Fox Sparrow (4)	Forest Edges	Warbling Vireo (25)	Riparian
Golden-crowned Kinglet (10)	Spruce Fir Forest	Western Tanager (9)	Dry Forest
Gray Jay (3)	Cool moist/subalpine Forest	Williamson's Sapsucker (3)	Snags, Dry Forest
Great Blue Heron (3)	Riparian/Open Water	Willow Flycatcher (5)	Riparian
Hairy Woodpecker (5)	Snags/Aspen	Wilson's Snipe (8)	Riparian
Hammond's Flycatcher (3)	Cool moist forest	Wilson's Warbler (5)	Riparian/Shrub

Bird Species[1]	Habitat	Bird Species[1]	Habitat
Hermit Thrush (8)	Cool Moist Forest	Winter Wren (2)	Forest Riparian
Lincoln's Sparrow (6)	Grassland/Shrub	Yellow-rumped Warbler (46)	Forest Generalist
MacGillivray's Warbler (13)	Shrubland	Yellow Warbler (64)	Riparian Forest
Mallard (1)	Riparian/Open Water		

1 – number in parenthesis is the number of observations for that species.

The project area provides diverse, well-distributed habitats for a variety of bird species. Some species are positively affected by land management while others are negatively affected. Hejl and others (1995) recommend a bird conservation strategy composed of three parts: (1) maintain, mimic, and restore natural vegetation patterns and processes; (2) ensure that the specific habitat components required by focus species are created and/or maintained; and (3) monitor the habitats and individual species.

The U. S. Fish and Wildlife Service is responsible for identifying migratory non-game birds that, without conservation actions, are likely to become candidates for listing under ESA. To that end, the Service identifies birds of conservation concern by region (USDI Fish and Wildlife Service 2008). The Stonewall Project area falls within Bird Conservation Region (BCR) 10, which includes 22 species. Of these, nine species have been documented in or near the project area or the project area provides suitable habitat. Table 88 identifies these species, their preferred habitat conditions and where environmental effects are assessed.

Table 88. Project area birds of conservation concern

Species	General Habitat Summary[1]	Environmental Consequences Assessed
Bald Eagle	Prefer late successional forests and shorelines adjacent to open water lakes and rivers.	Sensitive Species – Bald Eagle
Flammulated Owl	Mature forest with open canopy. Avoids dense young stands. Usually open conifer forests containing pine, with some brush or saplings. Shows strong preference for ponderosa pine.	Sensitive Species – Flammulated owl
Calliope Hummingbird	Seral shrublands and forest openings to moderate elevation in the mountains. Use re-growth from 8 to 15 years after logging or fire.	Habitats – Meadows and Shrubland
Williamson's Sapsucker	Middle to high elevations in montane spruce-fir, Douglas fir, lodgepole and ponderosa pine forests. Also in mixed deciduous/coniferous forest with aspen. Favors nest sites adjacent to open ponderosa pine forests. Restricted to large diameter trees and snags for nesting, except in aspen.	Habitats – Snag and downed wood; MIS-Pileated Woodpecker
Lewis's Woodpecker	Primarily breeds in open ponderosa pine forest, burned coniferous forest and open riparian woodlands. Occupy burned habitats after a shrub understory is established	Habitats – Dry Forest
Olive-sided Flycatcher	While they may occur in forested openings (e.g., disturbed areas), or open forests with low canopy cover. They are adapted to fire dependent landscapes and most often associated with post-fire habitat. Common in spruce and aspen but uncommon in mixed conifer or ponderosa pine.	Habitats – Cool, Moist Forest and Aspen
Willow Flycatcher	Breed in riparian habitat that has a mid-story of willows or alders and an intact shrub layer. Shrubs are often	Habitat - Riparian

Species	General Habitat Summary[1]	Environmental Consequences Assessed
	interspersed with openings.	
Brewer's Sparrow	Associated with shrublands, primarily sagebrush. Prefer unburned to burned habitat.	Habitats – Meadows and Shrubland
Cassin's Finch	Prefers open dry coniferous forests with mature lodgepole and ponderosa pine but will utilize Douglas fir or mixed coniferous forest. Post-fire and heavily logged sites used extensively.	Habitats – Dry and Cool, Moist Forest

1 – Habitat information taken from Montana Partners in Flight (2000)

Environmental Consequences

Methodology

Information used in the effects analysis includes aerial photographs, stand exam data, Northern Region Vegetation Mapping Project (R1-VMAP) data, field surveys and photos, data collected from project field visits and research literature including species and regional conservation assessments. Because this assessment involves a multi-scale analysis, Geographical Information System (GIS) coverages and data sets for vegetation stand and landscape structural characteristics, past management activities, stream, riparian and aquatic data, wildfire activity, national and state wildlife documentation databases and district and Forestwide observation data and surveys were collectively used to assess wildlife habitat conditions and effects.

This section discusses effects of individual treatments, alternative effects and effects to species and habitats evaluated in detail (table 90). Because anticipated effects are based upon implementation of project design features, design features specific to wildlife are also presented.

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. Project design features apply to both action alternatives. A description of the project design features relating to wildlife and other resources is displayed table 9, chapter 2.

All anticipated effects are based on implementation of the following wildlife project design features. Table 89 identifies project-specific pdfs related to wildlife and the estimated effectiveness of each design feature.

Table 89. Action alternatives - project design features and effectiveness for wildlife

Number	Category	Project Design Feature	Units/Roads	Effectiveness
WL-1	Roads and Corridor Design	To retain habitat for snag dependent species and species dependent on large diameter trees, the location of roads to be built then obliterated immediately following timber removal, would ensure, whenever practical, that veteran and relic survivor trees and snags would not be removed during construction.	Alt 2 – Roads 3-9, Alt 3 – Roads 5, 7 and 8	**Moderate**: road location is determined to a large degree by FS road construction standards and the local terrain near the site to be accessed. Cost reduction is also an important consideration. It is likely that some veteran and relic survivor trees would be removed when locating project roads, although overall there is a moderate likelihood that large diameter trees would be retained during layout.
WL-2	Skid Trail and Cable Corridor Design	To maintain habitat for snag-dependent species, the timber sale contract or contract administrator would ensure, whenever practical, that the design of skid trails and cable corridors avoid veteran and relic trees and snags	To be determined during implementation	**Moderate**; the sale administrator has authority under timber sale contract provisions to approve all skid trail and cable corridor locations. However, there are many practical considerations in choosing these locations. Avoiding individual desirable trees is only one of those considerations. It cannot be expected that all veteran and relic trees would be protected by this measure.
WL-3	Road Management (Wildlife Security)	Existing roads which are currently closed or restricted and utilized for this project would be retained in their pre-project road status.	Roads, all alternatives.	**High**; This would be implemented under the sale contract and by FS personnel following project completion. These treatments have been used effectively for many years and have a high likelihood of achieving desired objectives.
WL-4		Roads built then obliterated immediately following timber removal will be closed (e.g., gates, barricades) throughout project implementation to limit use to administrative use only.	Alt 2 – Roads 3-9, Alt 3 – Roads 5, 7 and 8	**High**; this is part of the proposed action and would be implemented under the sale contract and compliance monitoring, and post implementation by FS personnel. These treatments have been used effectively for many years and have a high likelihood of achieving desired objectives
WL-5	Snags	Retain a minimum of 2, 12- 20-inch d.b.h. snags per acre. If snags are not available, retain recruitment trees. Preferred species for retention include larch, ponderosa pine, Douglas fir, spruce and sub-alpine fir, in that order. No lodgepole snags would be retained to meet Forest Plan direction.	Harvest units	**Moderate/High**; these measures would be implemented using project layout, contract provisions and compliance monitoring and are standard practices used to help field crews identify appropriate trees to leave for wildlife habitat. These measures have been used successfully for many years and would have a moderate to high chance of avoiding and/or reducing adverse effects on snag dependent wildlife**.**
WL-6		In harvest and precommercial thinning units, retain snags greater than 20 inches diameter of any species unless they pose a specific safety or operability concern	Harvest and precommercial thinning units	

Number	Category	Project Design Feature	Units/Roads	Effectiveness
WL-7		In prescribed burn units, retain snags greater than 12 inches d.b.h. unless they pose a safety hazard	Prescribed burn Units	
WL-8		Whitebark pine snags would be retained unless they pose a safety or operability concern	Harvest and prescribed burn units	
WL-9	Downed Woody Debris	Forest Plan wildlife downed woody debris objectives would be met through retention guidelines under S/WS/F-3. The following measures would be implemented to ensure larger-diameter material is left on site: · Where they are present on site, maintain at least 4 down logs per acre at least 12 inches in diameter (at large end) and 20 feet long. · During burning, avoid the consumption of large coarse woody debris (e.g., logs greater than 10 inches in diameter at midpoint) to the extent possible.	All alternatives, treatment units.	**Moderate/High**; these measures would be implemented using project layout, contract provisions and compliance monitoring and are standard practices used to help field crews identify appropriate trees to leave for wildlife habitat. These measures have been used successfully for many years and would have a moderate to high chance of avoiding and/or reducing adverse effects on downed wood dependent wildlife.
WL-10	Vegetative Diversity	Where feasible and when consistent with fuel reduction objectives, use control lines and firing techniques to maintain pockets of understory vegetation and shrubs retained during timber harvest and small pockets of understory vegetation at scattered locations in un-harvested burn units.	All alternatives burn units.	
WL-11		Units would be evaluated following burning to determine if protective measures (e.g. fencing or grazing modifications) are necessary to allow vegetation recovery and promote aspen. This should be coordinated with the wildlife biologist if deemed necessary.	All alternatives burn units	**Moderate to High** – This would be implemented by FS personal during implementation and the likelihood that grazing impacts would be reduced is moderate to high. -

Number	Category	Project Design Feature	Units/Roads	Effectiveness
WL-12	Aspen	Promote and protect existing aspen as needed during implementation	All alternatives, treatment units.	**High**: This is part of the proposed action and would be implemented as part of sale contract or by FS personal and the likelihood that aspen would be protected is high.
WL-13	Elk	If elk calving (late May through mid-June) or nursery areas (late June through July) are identified prior to or during project implementation, management activities would be delayed during active periods.	All alternatives, treatment units.	**Moderate to High**: While it is possible that some calving areas would be missed, historical areas are known and there is a moderate to high likelihood that this would be effective at reducing impacts.
WL-14	Elk	To minimize impacts to elk, logging operations would be limited to one drainage at a time, designed to provide undisturbed areas within the drainage, and work would be completed in the shortest time possible.	All alternatives, treatment units	**High**: This is part of the proposed action and would be implemented through contract provisions and compliance monitoring under the sale contract. It has been used in the past and there is a high probability of reducing adverse effects to elk.
WL-15	Elk	If an elk wallow is identified during layout, treatment would be modified if necessary to ensure that adequate cover is retained adjacent to the wallow.	All alternatives, treatment units.	**Moderate**: While this would have a high likelihood of success in reducing impacts, some potential wallows could be missed depending on the time of year (wet conditions) during layout and marking and the overall effectiveness of this PDF is moderate.
WL-18	Elk	Recreational use of firearms would be prohibited for anyone working within an area closed to the general public.	All alternatives, Treatment units	**High**; These would be implemented through contract provisions and compliance monitoring under the sale contract or by FS personnel during implementation. They have been implemented for many years and there is a high probability of success.
WL-19	Elk	Slash depth would not exceed 1.5 feet across regeneration harvest units.	All alternatives, regeneration harvest units	
WL-20	MIS	If nest sites for MIS are discovered during the layout and/or implementation of the proposed action, the wildlife biologist will be notified to determine appropriate protection measures	All alternatives, treatment units.	**Moderate**: this would be implemented by FS personal during layout and through compliance monitoring. However it is possible some nesting would fall outside this period and some mortality would occur. As a result the likelihood of reducing impacts is moderate.

Number	Category	Project Design Feature	Units/Roads	Effectiveness
WL-21	Goshawk	Maintain a 40-acre no-activity buffer around known goshawk nests. Within the Stonewall East nest territory (Sucker Creek drainage), no openings created by mixed severity burning will occur between the 40-acre no-activity buffer and within a 180-acre radius of the nest.	Alt 2 and 3 - Units 43 and 72. Alt 2 - Unit 80, Alt 3 – Unit 80a	**High**; These would be implemented through contract provisions and compliance monitoring under the sale contract or by FS personal during implementation. They have been implemented for many years and there is a high probability of avoiding or reducing adverse effects on goshawk.
WL-22	Goshawk	Within active goshawk territories restrict ground disturbing activities inside Post-fledgling Areas (420 acres) between April 15th and August 15th. This will be coordinated with a wildlife biologist and buffer distances will be expanded if field data indicates that it is necessary.	Alt 2 and 3 - Units 43 and 72. Alt 2 - Unit 80, Alt 3 – Unit 80a	**High**; These would be implemented through contract provisions and compliance monitoring under the sale contract or by FS personal during implementation. They have been implemented for many years and there is a high probability of avoiding or reducing adverse effects on goshawk.
WL-23	Raptors	If raptor nests are identified during project implementation, a wildlife biologist will be contacted and appropriate buffers and Limiting Operating Periods established.	All alternatives, treatment units.	**High**; These would be implemented through contract provisions and compliance monitoring under the sale contract or by FS personal during implementation. They have been implemented for many years and there is a high probability of avoiding or reducing adverse effects on goshawk.
WL-25	TES Species	If any threatened, endangered or sensitive species are located during project layout or implementation, a wildlife biologist will be notified. Management activities would be altered, if necessary, so that protection measures can be applied.	All alternatives, treatment units.	**High**; This would be implemented through contract provisions and compliance monitoring under the sale contract. It has been used from many years and has a high probability of avoiding or reducing adverse effects on the intended species(s).
WL-26	Lynx	Cutting of brush along low speed (closed) roads will be done to the minimum amount necessary to maintain public safety	Roads to be identified during implementation	**High**: This would be implemented by FS personnel or contractors as part of project implementation. As a result road maintenance is controlled and there is a high likelihood the reduction in roadside cover would be minimized.
WL-27[1]	Lynx	Within burn units outside the 2-mile zone, a pre-treatment field review would be conducted to identify firing patterns and control lines that would be necessary to ensure that inclusions of stand initiation and multi-story hare habitat are not affected.	Alternative 2 units 81-84, 88; Alternative 3 units: 82-84, 88.	**High:** this would be implemented by FS personnel during layout and implementation prior to treatment. While some habitat may be treated to meet fuel objectives, the likelihood that lynx habitat will be affected will be greatly reduced.
WL-28[1]	Lynx	To promote or maintain lynx habitat characteristics while reducing fuels and promoting aspen/ponderosa pine, treatment would be designed and laid out in coordination with a wildlife biologist.	Alternative 2 units: 40-43, 46, 47 and 75: Alternative 3 units: 40-43, 46a, 46b, 46c, 47a, 47b, 47c and 75.	**High:** this would be implemented by FS personnel during layout and implementation prior to treatment. While some habitat may be treated to meet fuel objectives, the likelihood that lynx habitat will be affected will be greatly reduced.

Number	Category	Project Design Feature	Units/Roads	Effectiveness
WL-29	Bald Eagle	Project prescribed burn plans will consider the Beaver Creek Eagle Nest as sensitive and ensure that smoke is adequately dispersed away from the nest during the nesting season (January 1 through July 15th).	All alternatives, burn units	**High:** Smoke sensitive targets are identified in burn plans prepared prior to treatment and there is a high likelihood that smoke would be adequately dispersed away from the nest.
WL-30		Aircraft associated with proposed burning shall not be permitted within 1000 ft. of the Beaver Creek nest between January 1 and August 31.	All alternatives, burn units	**High:** this would be implemented by FS personnel or contractors a part of project implementation. Airspace is highly controlled and there is a high likelihood that aircraft would not adversely affect the nest.
WL-31	Migratory Birds	Prescribed burns and underburning would be implemented prior to May 15 or after July to protect nesting birds.	All alternatives underburning units	**High:** this would be implemented by FS personnel during project implementation and there is a high likelihood that burning would comply with seasonal restrictions
WL-32	Grass/forb And Shrub Communities	To maintain a shrub component and where feasible and consistent with fuel reduction objectives, use control lines and firing techniques to maintain 30 to 50 percent of existing shrubs in a patchy mosaic.	Alternatives 2 and 3, Unit 88	**Moderate to High:** Ignition and firing patterns can be effectively used to control fire intensity within prescribed fire units and reduce consumption of shrubs within mountain shrub communities. However because fire conditions can change during burning, effectiveness is considered moderate to high.
WL-34	Old Growth	Stands classified as old growth would be burned with low-intensity fire to minimize mortality to trees greater than 19 inches d.b.h.	Alternative 2 Unit 81	**High:** Pre-treatment surveys and ignition and firing patters can be effectively used to reduce burning intensity reducing the likelihood that large diameter trees would be killed.

Alternative Effects

Alternative Effect Summary

The following table displays a summary of effects to habitat and species in the Stonewall Vegetation Project area by alternative. Information presented is based on alternative, treatment and species- or habitat-specific effects discussed throughout the analysis.

Table 90. Wildlife effects summary by alternative

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Dry Forest[1]	Due to the absence of low severity fire, open-canopy mid to late seral dry forest habitat would continue to decline. There may also be a long-term reduction in species diversity (ponderosa pine, western larch and aspen) and large diameter trees and snags. Early seral habitat would continue to decline. Habitat for species that prefer or require mid to late seral closed canopy habitat would continue to increase and would predominate on 82 percent of the dry Douglas fir BPS and 98 percent of the ponderosa pine/Douglas-fir BPS.	Under this alternative, early seral and open canopy mid and late seral habitat would increase and move closer to reference conditions. Mid to late seral closed canopy habitat would decrease, would move closer to reference conditions and would continue to predominate on 62 percent of the dry Douglas fir BPS and 51 percent of the ponderosa pine/Douglas fir BPS. Species diversity, ponderosa pine and large diameter trees and snags would be maintained in the short term and increase over time. Habitat for species that prefer or require dry forest open-canopy mature forest and large ponderosa pine would increase, whereas closed canopy habitat would decline. Of the alternatives considered, this alternative moves closest to reference conditions for both BPS's and all seral stages.	Early seral habitat would move closer to reference conditions for both the dry Douglas-fir and ponderosa pine/Douglas-fir BPS. Like alternative 2, open canopy mid to late seral habitat would increase and move closer to reference conditions, but at a reduced level. Closed canopy habitat would decrease to 72 percent of the dry Douglas-fir BPS and 65 percent of the ponderosa pine/Douglas-fir BPS. All closed canopy seral stages would move closer to reference conditions. Like alternative 2, species diversity, ponderosa pine and large diameter trees and snags would be maintained in the short term and increase over time. Habitat for species that prefer or require dry forest open-canopy mature forest and large ponderosa pine would increase, whereas closed canopy habitat would decline.
Cool-moist Forest[1]	In the short and long term stands would continue to progress to climax, with a decrease in seral species (ponderosa pine, aspen, whitebark pine, western larch, aspen, Douglas-fir and Engelmann spruce. Stands would become more homogeneous with closed-canopy conditions predominating. Early seral and open canopy habitat would remain well below reference conditions, whereas closed canopy habitat would remain above reference conditions. Closed canopy habitat would occur on 85 percent of the moist Douglas-fir BPS and 67 percent of the lower sub-alpine fir BPS.	Early seral habitat would increase and move closer to reference conditions. Within the moist Douglas-fir BPS, mid and late seral open closed habitat would move closer to reference conditions. Within the lower sub-alpine fir BPS, late seral closed and mid-seral open habitat would move closer to reference conditions, whereas mid-seral closed and open habitat would move farther away from desired conditions. Due largely to the restoration of fire, species diversity (ponderosa pine, aspen, western larch, whitebark pine) would increase. Large diameter trees and snags would be maintained over the long-term. Closed canopy habitat would occur on 61 percent of the moist Douglas-fir BPS and 52 percent of the lower sub-alpine fir BPS.	Changes in early seral habitat and changes in seral conditions within the lower sub-alpine for BPS would be the same as alternative 2. Within the moist Douglas-fir BPS, late-seral habitat and mid-seral open habitat would move closer to reference conditions, but at a reduced level from that of alternative 2, whereas this alternative comes closest to mid-seral closed reference conditions. Species diversity (ponderosa pine, aspen, western larch, whitebark pine) would increase on sites treated. Large diameter trees and snags would be maintained over the long-term. Closed canopy habitat would occur on 68 percent of the moist Douglas-fir BPS and 52 percent of the lower sub-alpine fir BPS.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Upper Sub-alpine[1] Fir	Due the continued absence of fire and insect and disease concerns, both stand and landscape level whitebark pine would likely continue to decline. If high intensity fire does occur it is likely that existing pine regeneration would be reduced. Habitat for species such as grizzly, red squirrel and Clark's nutcracker, as well as many mammals and birds that utilize its seeds may also decline.	Approximately 900 acres of stands containing a predominance of whitebark pine would be burned with mixed severity fire. Of this, 125 acres or 21 percent of the upper sub-alpine fire BPS would be treated. Over the long term this is expected to maintain whitebark pine across the landscape and provide habitat for grizzly and other species that prefer or require this declining habitat.	
Riparian	Riparian habitats would be largely unchanged and continue to be available. Over the long term, hardwood and shrub diversity would likely continue to decline due to conifer encroachment and habitat for species that prefer these components may be reduced.	With implementation of INFISH buffers, much of the riparian habitat would not be treated, although scattered low-intensity burning would occur. Where burning occurs, herbaceous vegetation and shrubs/hardwoods would increase and riparian habitat would be maintained or improved. Riparian habitats will remain intact and would continue to be available.	
Mountain Meadow/Shrub	Shrub and meadow habitat may expand somewhat where MPB mortality is high, although continued conifer encroachment would likely reduce meadow/shrub habitat over the long term. Little shrub regeneration would occur and mature and decadent shrubs would increase. This habitat would largely be maintained, although herbaceous vegetation and shrub diversity would continue to be low or decline.	Prescribed fire is proposed in 11 percent and 13 percent of the mountain meadow and shrub habitat respectively. Over the short term herbaceous vegetation and shrubs would be reduced on the acreage treated. Grass/forb abundance and diversity would increase within 1-2 years of treatment and with implementation of project design features a shrub component would be maintained on all sites. Over the long term, herbaceous vegetation and shrubs would increase due to stimulation of new growth by burning and reduced conifer encroachment. Forage and cover associated with these communities would be improved on the acreage treated.	
Aspen	Due to the absence of fire, existing aspen would continue to decline and over the long term the distribution and abundance would be reduced or eliminated (in the absence of future disturbance). Habitat for wildlife species that prefer or require aspen would continue to decline.	Lands containing an aspen component would be treated on approximately 6,000 acres. In addition to improving the amount of aspen, prescribed fire is also expected to improve the quality of forage. Habitat for wildlife species that prefer or require aspen would be maintained or improved on sites treated.	Lands containing an aspen component would be treated on approximately 5,000 acres. In addition to improving the amount of aspen, prescribed fire is also expected to improve the quality of forage. Habitat for wildlife species that prefer or require aspen would be maintained or improved on sites treated.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Dead Wood	Snag availability in all size classes would remain high for the next few years. While the availability of small to medium diameter snags would remain high over the long-term, as existing large snags fall down and due to a reduction in ponderosa pine regeneration, recruitment of future large diameter snags would be reduced. Habitat for species that utilize downed woody debris would remain high.	Approximately 64 percent of the project area would be unaffected by treatment and snags and down wood will remain high on these lands. Harvest would reduce snags and down wood on 3,099 acres and burning would reduce down wood on another 463 acres. Snag availability would increase within burn units and harvest sites would retain large snags and between 5 and 20 tons per acre of down wood. Adequate snags and downed wood would be maintained to meet wildlife needs.	Approximately 72 percent of the project area would be unaffected by treatment and snags and down wood will remain high on these lands. Harvest would reduce snags and down wood on 2,298 acres and burning would reduce down wood on another 4,265 acres. Snag availability would increase within burn units and harvest sites would retain large snags and between 5 and 20 tons per acre of down wood. Adequate snags and downed wood would be maintained to meet wildlife needs.
All Biophysical Settings	Due to elevated fuels across the project area the risk of wildfire would remain high. The likelihood of high intensity stand-replacing wildfire is highest under this alternative.	Risk of wildfire would be reduced on approximately 35 percent of the project area proposed for treatment. Due to the landscape level burning proposed, wildfire risk would also be reduced on lands interspersed with treated areas and this alternative would result in the lowest risk of stand-replacing wildfire.	Risk of wildfire would be reduced on approximately 27 percent of the project area proposed for treatment. Due to the landscape level burning proposed, wildfire risk would also be reduced on lands interspersed with treated areas. Wildfire risk would be reduced, but at a reduced level from that of alternative 2.
Lynx	Over the short term there would be little change in lynx habitat. As stands open up due to MPB mortality, conifer regeneration and foraging habitat would increase. Cover would remain high due to elevated levels of downed wood and continued development of the understory. Stands with little MBP mortality would remain closed and cover and forage would be slow to develop. Den and foraging habitat have been reduced on 28 percent of BL-08 as a result of recent fires. Due to wildfire risk, the likelihood of a further reduction in cover/foraging habitat would remain high. Stand initiation habitat occurs on 1,971 acres. Multi-storied foraging habitat would occur on 11,913 acres, and mid-seral habitat would occur on 16,445 acres. Winter use and snow compaction would be largely unchanged.	There would be a 8 percent reduction in winter hare habitat under this alternative, whereas mid-seral habitat would be reduced by five percent. All winter foraging habitat proposed for treatment occurs in the CWPP WUI. While some foraging habitat would be retained on sites treated (unburned areas and riparian buffers), it would take 15 to 20 years before foraging habitat is restored. There would be some increase in over snow activity at lower elevations in harvest sites. Over time proposed actions would promote aspen, increase shrub and conifer diversity and promote development of foraging habitat on approximately 5,800 acres of mapped lynx habitat. Connectivity and landscape-level habitat would be maintained. Risk of high intensity wildfire would be reduced. Proposed actions and anticipated effects are consistent with the NRMLD and BO. Multi-storied critical habitat would be reduced by 117 acres.	There would be a five percent reduction in winter hare habitat, whereas mid-seral habitat would be reduced by four percent. All winter foraging habitat proposed for treatment occurs in the CWPP WUI. While some foraging habitat would be retained on sites treated (unburned areas and riparian buffers), it would take 15 to 20 years before foraging habitat is restored. There would be some increase in over snow activity at lower elevations in harvest sites, but fewer acres would be affected than under alternative 2. Over time proposed actions would promote aspen, increase shrub and conifer diversity and promote development of foraging habitat on approximately 4,200 acres of mapped lynx habitat. Connectivity and landscape level habitat would be maintained. Risk of high intensity wildfire would be reduced. Proposed actions and effects are consistent with the NRMLD and BO. Multi-storied critical habitat would be reduced by 94 acres.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Wolf	No known den or rendezvous sites would be affected. Human access and potential impacts to wolves, as well as prey availability (deer and elk) and suitable den, rendezvous and foraging habitat would also be largely unchanged.	No known den or rendezvous sites would be affected. Short-term disturbance to foraging wolves could occur. Big game populations and wolf foraging opportunities would be maintained.	
Grizzly	Core, security habitat, TMRD and OMRD would be unchanged. Human access and potential impacts to bear would be largely unchanged. Over the short term there would be little change in habitat. Over time whitebark pine would continue to decline.	During implementation, core habitat would not be reduced by in either subunit, and OMRD and TMRD would also remain unchanged in the Red Mountain subunit. Wuthin the Arrastra Mountain subunit, OMRD would increase by 2%, and although the TMRD percentage would remain unchanged, there would be a slight increase due to 2.6 miles of roads built then obliterated immediately following timber removal. Following implementation, Core, TMRD and OMRD would revert back to the existing condition.While no mortality is anticipated, short-term disturbance and displacement is possible during treatment. A total of 5,526 acres and 2,691 acres of the Arrastra and Red Mountain sub-units would be affected. Cover would be reduced on most of this acreage, although un-treated areas would be maintained and interspersed within and adjacent to treatment units. Within modeled den habitat, 250 acres would be reduced and 980 acres would be burned. No high quality den habitat would be treated and 94 percent of the existing den habitat would be unaffected. Treatment would ensure that whitebark pine is retained on sites affected and across the landscape.	During implementation, core habitat would not be reduced by in either subunit, and OMRD and TMRD would also remain unchanged in the Red Mountain subunit. Within the Arrastra Mountain subunit, OMRD would increase by 1%, and although the TMRD percentage would remain unchanged, there would be a slight increase due to 0.4 miles of roads built then obliterated immediately following timber removal.While no mortality is anticipated, short-term disturbance and displacement is possible during treatment. A total of 4,179 acres and 2,039 acres of the Arrastra and Red Mountain sub-units would be affected. Cover would be reduced on this acreage, although un-treated areas would be maintained and interspersed within and adjacent to treatment units. Within modeled den habitat, 232 acres would be reduced and 937 acres would be burned. No high quality den habitat would be treated and 94 percent of the existing den habitat would be unaffected. Treatment would ensure that whitebark pine is retained on sites affected and across the landscape.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Wolverine	Human access, prey availability including big game (carrion) would be largely unchanged. Den habitat would be maintained or possibly improved due to increased levels of downed woody debris. Landscape level connectivity and travel/dispersal corridors would be maintained..	Seven percent of the analysis area natal den habitat would be affected by burning. There are no impacts to denning animals anticipated although disturbance to foraging animals could occur. Suitable foraging habitat would be reduced on approximately 2,221 acres. Foraging habitat quality would be modified on another 5,249 acres due to reduced canopy and DWD. Landscape connectivity, travel corridors and prey/carrion availability would be maintained	Seven percent of the analysis area natal den habitat would be affected by burning. There are no impacts to denning animals anticipated although disturbance to foraging animals could occur. Suitable foraging habitat would be reduced on approximately 1,641 acres. Foraging habitat quality would be modified on another 4,472 acres due to reduced canopy and DWD. Landscape connectivity, travel corridors and prey/carrion availability would be maintained.
Fisher	While there would likely be some future reduction in canopy cover, with increased levels of downed woody debris, suitable habitat would be largely maintained. Similarly, prey availability would not be expected to change, although risk of stand-replacing wildfire is greatest under this alternative.	Human access would be largely unchanged. While no mortality is anticipated short-term disturbance to foraging individuals could occur during treatment Suitable habitat would be reduced on approximately 994 acres of den/rest habitat and 287 acres of foraging habitat. Approximately 71 percent of the existing suitable habitat would be maintained. Preferred riparian habitat and travel corridors as well as prey availability would be maintained.	Human access would be largely unchanged. While no mortality is anticipated short-term disturbance to foraging individuals could occur during treatment. Suitable habitat would be reduced on approximately 470 acres of den/rest habitat and 135 acres of foraging habitat. Approximately 86 percent of the existing suitable habitat would be maintained. Preferred riparian habitat and travel corridors as well as prey availability would be maintained.
Townsend's big-eared bat	Hibernacula, swarming and roost habitat would not be affected and foraging habitat would be largely unchanged.	Hibernacula, swarming and roost habitat would not be affected A total of 8,562 acres of suitable foraging habitat would be affected by treatment. No mortality is anticipated although short-term disturbance from smoke to foraging bats could occur. Available foraging habitat would be widespread.	Hibernacula, swarming and roost habitat would not be affected. A total of 6,562 acres of suitable foraging habitat would be affected by treatment. No mortality is anticipated although short-term disturbance from smoke to foraging bats could occur. Available foraging habitat would be widespread.
Bald Eagle	Nest, foraging and roost habitat would be largely unchanged. There are no anticipated impacts to the existing eagle nest.	With implementation of project design features, there are no direct effects to nesting birds or reproduction anticipated. Approximately 100 acres of potentially suitable nest habitat would be reduced. Foraging habitat would not be treated, although short-term disturbance to foraging birds could occur. Untreated nest and foraging habitat would continue to be available.	

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Black-backed Woodpecker	Existing low quality habitat would be unchanged, whereas high quality post-burn habitat would continue to decline. Because the risk of wildfire is highest under this alternative, it is likely that suitable high quality habitat would continue to be available in the future. Suitable BBW habitat would continue to be available across the Forest.	Because no high quality habitat would be affected, there is no mortality anticipated and the likelihood of disturbance is low. Low quality habitat would be reduced on approximately 3,100 acres, whereas future high quality habitat would be created on approximately 1,200 acres due to high intensity burning. Existing high quality burned habitat would continue to decline and the likelihood that future high quality habitat would be created through wildfire would be reduced. Suitable BBW habitat would continue to be available across the Forest.	Because no high quality habitat would be affected, there is no mortality anticipated and the likelihood of disturbance is low. Low quality habitat would be reduced on approximately 1,895 acres, whereas high quality habitat would be created on approximately 800 acres due to high intensity burning. Existing high quality burned habitat would continue to decline and the likelihood that future high quality habitat would be created through wildfire would be reduced. Suitable BBW habitat would continue to be available across the Forest.
Flammulated Owl	Because this species is strongly associated with open-canopy habitats, particularly in the dry forest BPS, suitable flammulated owl habitat would continue to decline under this alternative. While large diameter nest trees would increase in the short term, availability would decline over time. The likelihood of high intensity wildfire is greatest under this alternative.	Disturbance to nesting/foraging birds is possible. Existing habitat would be reduced by 126 acres or nine percent, whereas treatment would promote preferred structural conditions on 31 percent of existing habitat. Within currently unsuitable dry forest habitat, proposed burning and intermediate harvest would promote preferred structural conditions on 3,288 acres. Treatments would promote ponderosa pine and long-term recruitment potential nest trees. .	Disturbance to nesting/foraging birds is possible. Existing habitat would be reduced by 71 acres or nine percent, whereas treatment would promote preferred structural conditions on 22 percent of existing habitat. Within currently unsuitable dry forest habitat, proposed burning and intermediate harvest would promote preferred structural conditions on 2,353 acres. Treatments would promote ponderosa pine and long-term recruitment potential nest trees. .
Western Boreal Toad	Western boreal toads and their habitat would not be affected. The risk of stand-replacing wildfire and a long-term reduction in breeding and upland habitat is highest under this alternative.	Breeding habitat would not be treated, although foraging individuals could be affected. Over 8,500 acres of upland habitat would be affected. Suitable habitat would continue to occur on sites treated and long-term foraging habitat would be improved. The likelihood of impacts to breeding and upland habitat from high severity wildfire are lowest under this alternative.	Breeding habitat would not be treated, although foraging individuals could be affected. Over 6,500 acres of upland habitat would be affected. Suitable habitat would continue to occur on sites treated and long-term foraging habitat would be improved. The likelihood of impacts to breeding and upland habitat from high severity wildfire would be reduced.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Northern Goshawk	Human access and disturbance to nesting and foraging birds would be largely unchanged. Existing old growth habitat would remain unchanged. Closed canopy conditions and suitable nest habitat would increase. Landscape diversity associated with foraging and post-fledging habitat would be largely unchanged.	With implementation of project design features, no direct effects to nesting birds or reproduction are anticipated. Short-term disturbance to foraging birds and fledged young during implementation could occur. Regeneration harvest and openings created by mixed severity fire would reduce nesting and foraging habitat by 444 acres and 684 acres respectively. Approximately 90 percent of the suitable nest and foraging habitat would be retained. Suitable nest, forage and PFA habitat would occur in all affected drainages and landscape conditions resulting from treatment are consistent with goshawk use.	With implementation of project design features, no direct effects to nesting birds or reproduction are anticipated. Short-term disturbance to foraging birds and fledged young during implementation could occur. Regeneration harvest and openings created by mixed severity fire would reduce nesting and foraging habitat by 324 acres and 261 acres respectively. Approximately 95 percent of the suitable nest and foraging habitat would be retained. Suitable nest, forage and PFA habitat would occur in all affected drainages and landscape conditions resulting from treatment are consistent with goshawk use.
Pileated Woodpecker	Old growth habitat would not be treated. Suitable large diameter snags for nesting would remain common for the next 10-20 years. Due to reduced ponderosa pine regeneration and concentrated mortality of existing trees, large diameter snags would be reduced in the future. Foraging habitat would increase due to continued insect and disease related mortality.	Approximately 67 percent of the suitable habitat within the project area would be unaffected. A long-term reduction in habitat would occur on 542 acres, whereas the quality of suitable habitat would be reduced for 10 to 20 years on 2,035 acres. Over the long term restoration of open grown ponderosa pine and western larch may improve habitat on approximately 5,700 acres.	Approximately 77 percent of the suitable habitat within the project area would be unaffected. A long-term reduction in habitat would occur on 352 acres, whereas the quality of suitable habitat would be reduced for 10 to 20 years on 1,455 acres. Over the long term restoration of open grown ponderosa pine and western larch may improve habitat on approximately 4,500 acres.
Hairy Woodpecker	Suitable snags and nesting and foraging habitat would be maintained and continue to be widely available.	Effects are expected to be similar to those described under pileated woodpecker.	Effects are expected to be similar to those described under pileated woodpecker
American Marten	Suitable closed-canopy habitat has been reduced due to MPB mortality, although it is expected that existing habitat would be largely maintained.	While mortality or disturbance are possible, because marten are largely restricted to upper elevations and deep snow (i.e. lands not proposed for treatment) and because widespread canopy reduction has reduced habitat suitability and likely use of the area, the likelihood of mortality is low. Suitable habitat would be reduced by 459 acres (7 percent)due to regeneration harvest and fire created openings. Due to structural changes (canopy/dead wood), there would be a 15- to 20-year reduction in habitat quality on 1,731 acres. Treatments would improve species and landscape diversity. 64 percent of the suitable habitat would be unaffected.	While mortality or disturbance are possible, because marten are largely restricted to upper elevations and deep snow (i.e. lands not proposed for treatment) and because widespread canopy reduction has reduced habitat suitability and likely use of the area, the likelihood or mortality is low. Suitable habitat would be reduced by 283 acres (4 percent) due to regeneration harvest and fire created openings. Due to structural changes (canopy/dead wood), there would be a 15- to 20-year reduction in habitat quality on 1,088 acres. Treatments would improve species and landscape diversity. 75 percent of existing habitat would be unaffected.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Elk	Hunter access would be unchanged. No change in open road density, elk security or habitat effectiveness would occur. Neither herd unit would comply with Plan standard 4a. Hiding cover would be provided on 56 percent and 36 percent of the Beaver Creek and Keep Cool Creek HUs respectively. Compliance with Plan standard 3 for hiding cover would occur on Beaver Creek HU, whereas Keep Cool Creek HU would continue to fall below the Plan threshold. Winter range thermal cover would be provided on approximately 5 percent of the Beaver Creek HU, and 4 percent of the Keep Cool Creek HU. Both units would continue to fall below Plan standard 3 thermal cover thresholds. Continuing MPB mortality would reduce hiding and thermal cover in some areas. Forage would remain low, hardwood and shrub diversity would continue to decline. Herd numbers would be largely unchanged.	During implementation, open road density would increase by 14.3 miles and there would be a 2044 acres (6 percent) reduction in security habitat. Post-implementation open road densities and security would be the same as alternative 1. Neither herd unit would comply with Plan standard 4a. Hiding cover would be provided on 48 percent and 35 percent of the Beaver Creek and Keep Cool Creek HUs respectively. Neither herd unit would comply with hiding cover requirements in Plan standard 3. Winter range thermal cover would be provided on approximately 3 percent of the Beaver Creek HU and 4 percent of the Keep Cool Creek HU, and both units would continue to fall below Plan standard 3 thermal cover thresholds. Forage diversity would be increased on approximately 3,933 acres and 2,498 acres of the Beaver Creek and Keep Cool Creek HUs respectively. Elk use of the project area would change during and post-implementation. Habitat would be maintained in the short term to support desired levels of elk. Over the long-term habitat would be maintained or improved.	During implementation, open road density would increase by 11.0 miles and there would be a 1367 acres (4 percent) reduction in security habitat. Post-implementation open road densities and security would be the same as alternative 1. Neither herd unit would comply with standard 4a. Hiding cover would be provided on 51 percent and 35 percent of the Beaver Creek and Keep Cool Creek HUs respectively. Keep Cool Creek HU would not comply with hiding cover requirements in Plan standard 3. Winter range thermal cover would be provided on approximately 4 percent of the Bevaer Creek and Keep Cool Creek HUs, and both units would continue to fall below Plan standard 3 thermal cover thresholds. Forage diversity would be increased on approximately 3,244 acres and 1,838 acres of the Beaver Creek and Keep Cool Creek HUs respectively. Elk use of the project area would change during and post-implementation. Habitat would be maintained in the short term to support desired levels of elk. Over the long-term habitat would be maintained or improved.
Mule Deer	Hunter access would be largely unchanged. Hiding and winter range thermal cover would be reduced in areas with MPB mortality and unchanged over much of the project area. Forage would remain low and hardwood/shrub diversity would continue to decline. Herd health is not expected to change.	Short-term and localized increase in hunter access would occur, although no long-term changes in hunter access are anticipated. Hiding cover would be reduced by approximately 3,538 acres, and winter range thermal cover would be reduced by 92 acres. 81 percent of the existing hiding and thermal cover would be maintained. Forage diversity on summer, winter and transition range would be increased on over 7,000 acres. Shrub, hardwood and landscape diversity would be improved. Herd health and cover and forage would be maintained in the short and long-term.	Short-term and localized increase in hunter access may occur. No long-term changes in hunter access are anticipated. Hiding cover would be reduced by 1,980- acres and winter range thermal cover would be reduced by 78 acres. 90 percent of existing hiding cover and 84 percent of winter range thermal cover would be maintained. Forage on summer, winter and transition habitat would be increased on over 5,000 acres. Shrub, hardwood and landscape diversity would be improved. Herd health and cover and forage would be maintained in the short and long-term.

BPS/Habitat/Species	Alternative 1	Alternative 2	Alternative 3
Migratory Birds	While overstory cover would decline in some areas due to continued MPB mortality, understory cover would continue to increase. Migratory bird habitat would remain largely unchanged. This alternative complies with the MBTA.	Proposed treatments would alter overstory and understory conditions on approximately 7,470 acres. Migratory bird habitat, including habitat for bird species of conservation concern, would be maintained across the landscape and declining habitats would be increased over the long term. Early, mid and late seral habitat would move closer to reference conditions. Project design features are in place to maintain migratory bird habitat and reduce potential mortality. This alternative complies with the MBTA.	Proposed treatments would alter overstory and understory conditions on approximately 5,710 acres. Migratory bird habitat, including habitat for bird species of conservation concern, would be maintained across the landscape and declining habitats would be increased over the long term. Early, mid and late seral habitat would move closer to reference conditions. Project design features are in place to maintain migratory bird habitat and reduce potential mortality. This alternative complies with the MBTA.

1 – see table 3 for an alternative comparison of seral habitats provided under each of the Biophysical settings.

Alternative 1 (No Action)

There would be no direct effects to wildlife because there are no treatments proposed under this alternative. Forested communities that largely developed with long fire-return intervals and the wildlife species characteristic of these communities would be largely unchanged.

Many project area forest communities historically developed with short fire-return intervals. Anticipated indirect effects under this alternative include continued shifts in species composition and diversity within these communities. For example, understory conditions including conifer encroachment and increased abundance of shade-tolerant species have increased in mid- and late-seral hab itat across the project area. In the absence of large-scale disturbance, these understory conditions would continue to increase. Effects on wildlife include increased habitat for species that prefer closed-canopy forest conditions and for species that prefer understories dominated by regenerating conifer. Conversely, there would be continued reduction in the open understory conditions that characterize fire dependent communities (e.g., ponderosa pine), and continued decline in suitable habitat for species that prefer or require open, mid- to later-seral forested stands with an herbaceous and shrub understory.

In the short term there would be little change in species composition. In the long-term without future disturbance stands would continue to progress successionally with continuing decreases in seral species and increases in climax species. Species composition within subalpine fir types would continue to change as seral species (ponderosa pine, whitebark pine, aspen, Douglas-fir and Engelmann spruce) die out and are replaced by sub-alpine fir. Species in Douglas-fir habitat types would experience similar changes, with species composition shifting to Douglas-fir.

Due to the shifts in fire and fire-tolerant species, as well as increased stand density, stands would be more susceptible to insect and disease-related mortality under this alternative. As a result, there would continue to be an increase in snags and down woody debris (DWD) and habitat for species that prefer or require these components. However due to the anticipated reduction in ponderosa pine, over the long term the availability of large-diameter trees and snags would be reduced. Along with species composition shifts, shade tolerant species would increase, making individual stands and the landscape more homogeneous and less structurally diverse.

As described under affected environment, due to years of fire suppression and past harvest, much of the project area currently contains dense forested stands that are relatively continuous across the landscape. As a result and considering fuels have further increased due to MPB mortality, the risk of stand-replacing wildfire is highest under this alternative.

Potential effects of invasive plants on wildlife are discussed in the Forest Weed Treatment FEIS (USDA Forest Service 2006c), whereas the likelihood of increased spread within the project area are discussed in the project weed report (USDA Forest Service 20011d). Without control it is expected that existing infestations would increase by approximately 14 percent per year. With implementation of biological and chemical control, this increase would be reduced and is expected to be largely contained. Stand-replacing wildfires are known to increase the risk of invasion and spread of invasive species (D’Antonia 2000). As a result, and considering that the risk of high intensity wildfire is greatest under this alternative, it is expected that invasive weeds would increase in the event of a wildfire. The effect on wildlife would vary depending on the acres affected and access (i.e., for control), but there would likely be a localized decrease in cover and forage as a result.

Alternatives 2 and 3 (Action Alternatives)

Direct and indirect effects of treatments are discussed by group and include species composition and structure changes, as well as potential direct and indirect effects to wildlife and wildlife habitat. Potential effects from timber harvest are discussed under Groups 1 through 5. Some burning is proposed within all groups, and because effects vary depending on the type of burning proposed (e.g., low intensity vs. mixed severity), effects of burning are discussed by burning type. Also, effects of roads and road management are discussed separately. The habitat and species-specific effects discussed are based, in part, on the treatment effects discussed here.

Effects by Treatment Group

Group 1(Intermediate Harvest) – Proposed harvest treatments would thin live trees and remove dead trees. All thinning would be from below and would favor trees of desired species. Trees would be thinned to an average spacing of 20 to 40 feet and 25 to 40 percent canopy cover would be maintained. Snags and 5-20 tons per acre of DWD including large-diameter logs would be retained.

Treatment would alter stand structure and understory conditions by removing primarily small and medium diameter trees and increasing light levels to the forest floor. This results in a decrease in cover and an increase in the establishment of understory vegetation. While increases in herbaceous vegetation would occur within 2 to 3 years of treatment, increased availability of woody vegetation would take longer (5-15 years). For stands where the target canopy closure is 25 to 40 percent, it is estimated that these sites would again provide 40 percent canopy closure in approximately 10 to 15 years.

Direct effects to wildlife from these harvest treatments may involve some direct mortality to less mobile species during logging. Cutting may also result in avoidance of the site by some species sensitive to disturbance, while other species would be attracted to the site because of the increased forage available on the site (generally within 2 years of treatment).

Over the long term (greater than 10 years) as the woody understory develops, treatment would create more diverse stand conditions with continued increases in both forage and cover. While mature forest species in the Rocky Mountains are generally less affected by partial harvest than regeneration harvest (Hejl 2011), a shift in species use following harvest can be expected, with benefits to ground foraging birds and small mammals and decreased use of some canopy and bole foraging species (Raphael et al. 1988 *in* Hejl 2011, Salabanks and Arnett 2002, USDA Forest Service 2006b). Potential effects to reptiles and amphibians would also vary, and because few reptiles occupy closed-canopy forests in the western United States, potential impacts to this group would be expected to be low. Conversely, because reducing canopy cover would result in warmer and drier conditions, potential impacts to amphibians would be greater including some reduction in diversity and abundance (USDA Forest Service 2006b). Due to increased structural diversity on these sites, amphibian diversity and abundance is expected to be restored as the understory develops and maintained over the long term.

Dead trees would be removed, so impacts to species requiring snags can be expected (Salabanks and Arnett 2002; Hejl 2011). Project design features that retain snags greater than 20 inches, as well as a component of small-diameter snags and snag recruitment trees, would reduce impacts to these species and ensure suitable snags would be retained on all sites. While treatment would reduce down wood, implementation of pdfs would retain between 5 and 20 tons per acre of for warm dry types, 10 to 20 tons per acre for other types and a component of large diameter logs. Treatments would result in improved stand structure and diversity (i.e., increase in aspen, ponderosa pine and western larch) over the long term; it is expected that the diversity of snag and downed wood dependent species would be maintained or improved (USDA Forest Service 2006b).

Following harvest, units would be underburned to promote ponderosa pine, early and fire-tolerant species or jackpot burned to reduce fuels. Also periodic low-intensity fire would be used to maintain stand resistance to fire and insects (described in the following section Burn Treatment Effects).

Collectively, treatments would initiate restoration of open stands dominated by mature Douglas-fir and ponderosa pine. Stands would be more resistant to wildfires and insect activity reducing potential for high intensity and high severity wildfires (USDA Forest Service 2012b) and insect epidemics. Treatment would promote development of future large-diameter trees and snags.

Under alternative 3, Group 1 treatments would be reduced by 76 percent (743 acres), maintaining closed canopy, early to mid-seral forest habitat on these lands. Reducing treatment would also reduce ponderosa pine and aspen increases by 664 acres and 464 acres respectively and maintain increased fuels and wildfire risk.

Group 2 (Intermediate Harvest) – Precommercial thinning treatments would thin small-diameter trees to a spacing of 12 to 20 feet and would be completed by hand or machine, depending on tree size. Target canopy closure would be 25 to 40 percent, and like Group 1 harvest, with implementation of pdfs a minimum of 5-20 tons per acre DWD, and large-diameter DWD and snags would be retained following treatment.

Direct effects to wildlife would be similar to Group 1 and involve avoidance of the site and some direct mortality to less mobile species. Like group 1, treatment involves modifying the overstory stand structure by opening up the canopy and increasing light to the forest floor. As a result, treatment would increase herbaceous and woody vegetation on the forest floor and increase understory diversity on the site. While there would be an immediate (1-2 years) increase in herbaceous species, increases in woody vegetation would take longer (5-10 years). Conversely, there would be a decrease in cover until woody understory vegetation is established on the site and more closed canopy conditions are restored (10 to 15 years). As a result, effects include a reduction in habitat, decreased abundance of some mature forest species and improved habitat conditions for early seral and ground foraging species. Over the long term, treatments would result in a more diverse stands with increased levels of foraging and cover throughout the site.

Slash would be piled and burned in some units; effects are described in the Burn Treatment Effects section below.

Treatment would improve the health and vigor of remaining trees and increase resistance to insects and disease. Treatment would also promote the growth of large, fire-resistant trees and over the long term, would promote restoration of open stands of mature Douglas-fir, ponderosa pine and western larch.

Under alternative 3, Group 2 treatments would be reduced by 26 percent (310 acres), maintaining closed canopy, early to mid-seral forest habitat on these lands. Reducing treatment would also reduce the potential increases of ponderosa pine, western larch and aspen by 204 acres, 106 acres and 76 acres respectively. Fuels and wildfire risk would remain unchanged on this acreage.

Group 3 (Regeneration Harvest) - Treatments include seedtree and shelterwood regeneration harvest. This treatment differs from Group 1 and Group 2 in that most of the live, and many of the dead trees would be removed, although seed and reserve trees would be retained. In some shelterwoods trees would be retained in groups, whereas in other units the remaining trees would be evenly distributed. Ponderosa pine, Douglas-fir and western larch would be planted where necessary to regenerate the stands to the desired seral and fire-resistant species.

Because most of the existing canopy would be reduced, contiguous blocks of mature forest habitat would be reduced. However, regeneration harvest is not proposed in areas of remote habitat (e.g., elk security or grizzly bear core) and these areas would be maintained. Treatments are only proposed in areas with concentrated mortality where connectivity and habitat for species that prefer closed canopy forest has already been reduced.

As with Groups 1 and 2, effects include some direct mortality to less mobile species and avoidance by species that are sensitive to disturbance. While intermediate harvest treatments (Groups 1 and 2) result in relatively minor changes in wildlife use, regeneration treatments can result in a much more dramatic change and some mature forest wildlife may be displaced for over 50 years, until a predominantly mature canopy is re-established. Species diversity and abundance can be expected to change (Salabanks and Arnett 2002). The reduction in overstory trees results in an increase in herbaceous vegetation, shrubs and tree seedlings, which provides habitat for many early seral species, as well as species that utilize a combination of early successional and mature forest.

Wildlife use of the site following treatment also varies over time. For example habitat for species that utilize herbaceous vegetation would be improved within 1 to 2 years of treatment, whereas it would take up to 15 years for woody vegetation (seedlings and shrubs) to develop on the site. So while the wildlife community would shift to primarily early seral species immediately following treatment, many mature forest species such as elk would continue to use the sites due to the large quantities of forage and low-growing cover created. As the canopy closes (30-40 years), early seral species would be replaced by mid-seral species and over the long term, wildlife diversity and abundance would be improved on the site due to changes in species (increase in aspen, ponderosa pine and western larch) and structural diversity.

Many of the units would be burned following harvest to reduce fuels and prepare the site for natural regeneration or planting. Natural regeneration in combination with species diversity planting would increase dominance by Douglas-fir, ponderosa pine and western larch. Over the long term, treatment would promote development of a multi-storied stand that is dominated by fire resistant species, but also contains a minor Engelmann spruce and subalpine fir component that is more resilient to wildfire and insect activity.

Under alternative 3, treatments would be reduced by 11 percent (81 acres), maintaining open and closed canopy mid- to late-seral forest habitat on these lands. Reducing treatment would also reduce the potential increases of ponderosa pine, western larch and aspen by 86 acres, 8 acres and 14 acres respectively. Fuels and wildfire risk would remain unchanged on this acreage.

Group 4 (Regeneration Harvest) – Treatments include a clearcut harvest in which all trees would be removed except for scattered clumps or individual trees and trees necessary to meet resource needs (e.g., snags and DWD to meet wildlife and soil objectives). Following harvest, units would be burned to reduce fuels and promote natural regeneration. Sites are expected to naturally regenerate, although some planting of Douglas-fir, lodgepole pine and western larch may be done.

In the short term, units would naturally regenerate to single-storied stands of predominantly lodgepole pine with some Douglas-fir and ponderosa pine regeneration and remnant large-diameter trees. Over the long term, treatment (including supplemental planting) would promote a more diverse insect and fire resistant stand that is predominantly lodgepole pine, but contains an increased component of ponderosa pine, Douglas-fir, aspen and western larch. Like Group 3, these sites occur in areas that have already experienced concentrated mortality.

Effects on wildlife and wildlife habitat would be similar to those of Group 3 and the resulting stand conditions would be maintained by periodic low intensity fire described in the Burn Treatment Effects section below.

Under alternative 3, treatments would be reduced by 32 percent (70 acres), maintaining open and closed canopy mid- to late-seral forest habitat on these lands. Reducing treatment would also reduce the potential increases of ponderosa pine, western larch and aspen by 53 acres, 55 acres and 15 acres respectively. Fuels and wildfire risk would remain unchanged on this acreage.

Group 5 (Intermediate Harvest) – Treatment includes a sanitation salvage harvest that would remove dead and dying trees. Trees would be removed using ground based equipment. Slash would be reduced by hand piling and burning. While there would be little change in overstory stand conditions, effects of treatment include a reduction in ladder and surface fuels and understory vegetation.

Because 40 to 60 percent canopy cover would be maintained on all sites and with implementation of pdfs to retain snags and downed woody debris, effects on wildlife and wildlife habitat would be similar to those described under Group 1.

Slash would be piled and burned in some units; effects are described in the Burn Treatment Effects section below.

There is no difference between alternatives

Group 6 (Prescribed Burn) – Treatment involves cutting small trees on portions of the treatment units to create fuel beds conducive to low intensity burning. The prescribed burning would create openings less than 5 or 10 acres in size, with opening size varying by unit. Units would be prescribed burned to reduce fuels, kill small-diameter undesirable trees and prepare sites for natural regeneration. Prior to burning, all units would be assessed to identify existing whitebark pine regeneration that needs to be protected during treatment, and existing aspen clones would be released by cutting conifers within and around the clone.

Herbaceous vegetation would increase within the second year of treatment and continue to provide increased levels of forage for up to 30 years. Within 5 years woody vegetation (trees and shrubs) would start to become established on the site. Tree regeneration would establish in the openings and other areas of low stocking, with increases in Douglas-fir, ponderosa pine, whitebark pine and western larch. Over the long term, stands would be characterized by more complex, multi-stored conditions with a variety of age classes, and would be more resilient to wildfire and insects.

Overall, burning would occur in a patchy mosaic and approximately 20 percent of the site being unaffected, 25 percent of the site would appear as fire-created openings, and approximately 55 percent of the site would be underburned.

Effects on wildlife and wildlife habitat are discussed in the Burn Treatment Effects section below.

Groups 7 and 8 (Prescribed Burn) – Treatments include cutting small trees on portions of the site to create fuelbeds conducive to low intensity burning. Where the opportunity exists, small trees would be cut to create small openings around whitebark pine, ponderosa pine, western larch and Douglas-fir to promote regeneration. Units would be burned to reduce fuels, cause additional mortality of undesirable trees and prepare the sites for natural regeneration. Treatments would create patches of mortality of 5, 10 or 20 acres in Group 7 units and 30 to 75 acres within Group 8 units. Like Group 6, all units would be assessed prior to burning to identify existing whitebark pine regeneration that needs to be protected during burning. Pre-burn treatments that would be implemented to promote whitebark pine include cutting and direction felling of conifer trees to increase fuel loading, improve the continuity of the fuelbed and reduce fuel loads around whitebark pine trees. These treatments would also be used to establish 1- to 5-acre areas that can be established as nutcracker caching sites. Like Group 6, suppressed conifers would be removed around existing aspen.

Effects would be similar to those described under Group 6, however, because of the larger canopy gaps created by more intense burning conditions, shade intolerant and fire tolerant species would increase, with the greatest increase occurring under Group 8. Also horizontal structure and age class diversity would increase due to the larger openings and pockets of understory regeneration created.

Approximately 20 percent of the site would be unburned within both group 7 and 8 units. Also within group 7 units approximately 25 percent would occur in openings 5 to 20 acres in size approximately 55 percent would receive a low-intensity burn. Within Group 8 units. approximately 30 percent of the site would be in fire-created openings of between 30 and 75 acres, and approximately 55 percent of the site would be underburned with low-intensity fire. Effects on wildlife are discussed below.

Group 9 (Prescribed Burn) – This treatment is only proposed under alternative 3 and involves prescribed burning using low-intensity fire to reduce fuels on the site following harvest. Effects are similar to those described under Group 6.

Group 10 (Intermediate Harvest mix with no harvest and Jackpot/pile burning) – This treatment is only proposed under alternative 3 and involves patches of thinning to promote ponderosa pine and aspen and reduce ladder fuels. . Like Group 1, understory vegetation would be enhanced, although more closed canopy conditions (i.e. greater than 40 percent canopy closure) would be maintained.

Effects on wildlife are discussed in the Burn Treatment Effects section below.

Burn Treatment Effects

This section summarizes effects of proposed burning under each of the action alternatives including low severity/underburning, mixed severity (MS) burning and pile/jackpot burning. Table 8 identifies the amount of each treatment proposed under each of the action alternatives.

Low Severity Fire, Site Preparation Burn, Broadcast Burn and Underburning

To ensure that desired burning conditions are met, all areas would be burned when weather conditions provide for safe ignition. A prescribed burn plan and all required documentation in accordance with USDA Forest Service, Region 1 or Helena National Forest standards must be completed and approved prior to implementation. These actions would ensure that burning conditions would be controlled and adequate smoke dispersal would occur.

Prior to treatment, Forest Service personnel would survey the site and identify firing patterns and retention areas expected to achieve objectives, including protection of riparian areas, shrub communities and unique or uncommon habitats. Collectively these actions would help to ensure fire-related effects are consistent with those anticipated.

Burning would take place in the spring or fall as long as required fuel, moisture and weather conditions are present. Once ignited, the burn moves through the project area driven by wind and terrain. Flame lengths should range from a few inches to 3 feet in height, consuming litter, grass, forbs and smaller fuels.

Effects on wildlife and wildlife habitat are determined by a number of factors including the burning intensity, as well as site-level fuels, topography and moisture conditions. This burn intensity is expected to consume the litter, fine fuels and small diameter trees and shrubs less than 5 inches in diameter (Bowles et al. 2007); it generally would not be hot enough to scorch the soil or result in mortality of overstory trees on most of the area burned. There would be small areas that contain higher fuel levels and/or site conditions that create more intense burning conditions. In these areas, some overstory mortality may occur; however, any mortality would be widely scattered and consist of small canopy gaps.

Burning intensity would not be uniform and treatment areas would have a mosaic of burned and unburned lands due to variations in site conditions. On average and based on past treatments, it is estimated that approximately 75 to 80 percent of the treatment area would be burned, with fingers and pockets of unburned areas occurring on approximately 20 to 25 percent of the unit. The amount and uniformity of burning would vary by forest type and topographic position. For example, south-facing slopes, plateau tops and drier forest types would likely experience a higher percentage of burned area. Burning intensity would be reduced in riparian areas, on northern exposures and within portions of units containing more mesic sites due to higher moisture conditions and lower slope position.

After ignition operations are completed and the prescribed burn has adequate time to move through the unit, mop-up operations extinguish those areas that are still burning. Mop-up usually involves putting out burning or smoldering vegetation such as tree stumps, snags or downed logs. Mop-up does not occur unless the source is likely to cause the fire to spread outside of the control lines. Control is accomplished with water spray and/or hand tools, although it may also include falling burning snags that would drop outside the fire line.

Direct Effects

Approximately 64 percent and 73 percent of the project area would not be treated under alternatives 2 and 3 respectively, and there would be no direct effects on those areas. The following is a discussion of potential direct effects on the acres proposed for treatment (table 8).

Proposed burning is expected to have some direct effects on wildlife inhabiting the site at the time of treatment, although this would vary depending on time of burn and fuel conditions, proximity to breeding habitat and species. For example, fall burns burn hotter, increasing the likelihood of mortality. While some animals may be killed during burning, behavioral avoidance of fire by wildlife is well documented, and large mobile mammals, adult birds and even small less mobile species (e.g., frogs and toads) are capable of either moving quickly to unburned refugia, or seeking out refugia in burrows and crevices (Kennedy and Fontaine 2009; Russell et al. 1999; Smith 2000; Yager et al. 2007). Potential direct impacts to riparian areas, as well as impacts to amphibian breeding habitat would be reduced with implementation of pdfs, streamside management zones, and considering that burned areas would be interspersed with unburned lands.

Most undesirable direct effects are overcome by choosing proper times, places and methods of prescribed burning. For example, because burning would occur largely outside the breeding season, potential for direct mortality is reduced (Bagne and Purcell 2008). Natural and human-ignited fire has historically been a part of Montana landscapes (Amacher et al. 2008) and many forest species have evolved with the presence of fire. Consequently, when mortality does occur, it is usually negligible at the population level (Lyon et al. 1978) and is not expected to adversely affect local populations for any species.

Indirect Effects

Indirect effects of proposed burning include modifications or changes in vegetative conditions on the affected sites at both the stand and landscape level (Kennedy and Fontane 2009). Generally, burning would result in a reduction in shrubs and woody material and an increase in herbaceous vegetation (Bowles et.al. 2007; USDA Forest Service 2006b). In the short term this is expected to improve habitat for species that prefer or require forested habitat with a grass/forb understory, and decrease habitat for species that utilize understory shrubs or low cover provided by small- diameter woody vegetation. Burning intensity would vary and most treatment areas are expected to have a mosaic of understory conditions. These changes vary over time and Metlen and Fiedler (2006) found that while burning initially reduced cover and richness of the understory, by year 3, understory richness increased when compared to the pre-treatment and control. While there would be a reduction in DWD on the site, implementation of pdfs would retain between 5 and 20 tons per acre for warm, dry types, and 10 to 20 tons per acre for other types. As a result, suitable standing and downed wood habitat would continue to be available following treatment.

Burning would modify understory conditions on up to 80 percent of the site, so there would be shifts in species diversity and abundance immediately following treatment. Changes in understory would vary over time. For example, small mammals that need high shrub cover to avoid predators may do poorly the first few years following treatment, whereas their numbers would be expected to exceed pre-treatment population levels when shrubs recover and forage (herbaceous vegetation and mast) increases (USDA Forest Service 2006b). So while impacts would affect species that prefer closed-canopy mature forest and utilize DWD and woody vegetation removed during burning, habitat would be restored within approximately 5 to 15 years. Implementation of pdfs (i.e., no ignition in riparian areas) and stream management zones would reduce burning in riparian areas. So while some fire may back into riparian habitat, these areas would be left largely intact. Considering that structural complexity and heterogeneity may be improved on the site (USDA Forest Service 2006b) and that the treated stand may be more resistant to wildfire and insects and disease over the long term, habitat conditions and wildlife diversity and abundance would be improved both within the unit and across the landscape.

Mixed Severity Fire

Like low-severity fire, a prescribed burn plan would be completed prior to implementation. Since mixed severity burning is complex, Forest Service personnel would identify firing and holding patterns to achieve objectives, including protection of sensitive or unique communities/features. So like low-severity burning, these actions would ensure that mixed-severity fire effects are consistent with those anticipated. Burning and mop up processes and conditions described under low-severity burning would be similar.

Treatment consists of low-intensity burning that consumes herbaceous vegetation and small diameter woody vegetation as well as pockets of more intense burning (resulting from fuels created in the pre-burn treatments) where much of the overstory is killed. Low-intensity burning would occur on 50 to 55 percent of the site, whereas mixed-severity burning would result in overstory mortality on between approximately 10 percent (Group 6), 20 percent (Group 7) and 20 to 30 percent (Group 8) of the unit. Approximately 20 to 25 percent of the site would be unburned, and based on effects of past treatment, unburned areas are expected to be dispersed across the site. Like low-severity burning, pdfs would reduce burning within streamside management zones and riparian habitat would be maintained.

Direct Effects

Direct effects to wildlife resulting from mixed-severity burning would be similar to those described under low-severity burning, except due to increased burning intensity in portions of the unit, the likelihood of mortality is greater. Mortality is expected to be low since approximately 80 percent of the site would be unburned or lightly burned.

Indirect Effects

Burning stimulates re-growth of vegetation and effects include enhancement of herbaceous vegetation on the area burned, as well as development of grasses, forbs, seedlings and shrubs within the canopy gaps created. Vegetative conditions post burning would be more diverse with small pockets of regenerating forest or herbaceous vegetation imbedded within the larger forested landscape. Over the long term the resulting forest communities would be more diverse and more resistant to stand-replacing wildfire due to the development of fire-tolerant trees (e.g., ponderosa and whitebark pine) and shrubs as well as early seral species (e.g., aspen).

Mixed severity burning promotes both early and late-successional habitat conditions that Halofsky et al. (2011) suggest can provide a unique vegetation and wildlife response. The critical habitat feature of mixed severity fire regimes affecting wildlife habitat is the mosaic of vegetation created, as well as the dynamic nature of that mosaic over time and space (Agee 1998 *in* Lehmkuhl et al. 2006). For example, low severity fires typically result in mature single-storied stands dominated by fire-resistant species. On mesic sites, understories can have a high component of fire-adapted shrubs. Moderate severity fires typically result in patchy mixed-age stands dominated mostly by large trees of fire-resistant species with a diverse understory. Consequently, the proposed burning is expected to promote more diverse habitat conditions (Arno 2000).

While burning would decrease DWD, the dynamics following a mixed severity burn are complex, with consumption of debris on the forest floor compensated by the creation of snags and patches of higher severity burning (Agee 2002). Also on average, woody debris appears relatively abundant in mixed severity vegetation types, although availability varies over time (Lehmkuhl et al. 2004), with high quality snags available for cavity nesting species (Bull et al. 1997). Also, although the availability of DWD fluctuates more than that of low severity fire, it contains elevated and relatively uniform levels of DWD, when compared to low intensity burning (Lehmkuhl et al. 2004).

Wildlife use of a site varies and species in early seral to mid-seral patches can vary depending on the size of the patch, seed source availability, or vegetative regeneration. Generally, the larger the patch, the greater the dominance of early seral tree species, and the proportion of species breeding in early seral stages tend to increase with increasing fire size and intensity (Lehmkuhl et al. 2004). As a result, sites receiving a Group 8 treatment (30- to75-acre openings) would provide more habitat for species that utilize a mixture of early and mid- to late-seral habitat, whereas sites receiving a Group 6 treatment (less than 10 acres) would be favored by species that prefer a mid- to late-seral habitat, but also utilize the structure provided by small early-successional forest. Due to the development of small to medium-sized openings, Group 7 treatment would likely provide habitat for a diverse group of species including early successional, and mid- to late-seral species.

Different fire severities produce different post-fire structures (i.e., stands of live trees with some dead snags with 100 percent and snags or shrubs) and these variations in post-fire structure should translate into variation in the wildlife response to fire (Smucker et al 2005 In OSU 2009). Recent studies have documented that avifaunal response varies with burn severity. For example Kotliar et al (2007) detected a broad range of responses to increasing burn severity. Overall 70 percent of the species included in their analysis exhibited either positive or neutral density responses to fire effects across all or portions of the severity gradient evaluated, although more research is necessary. Generally, management that includes a broad range of natural variability, including areas of severe fire, and that accounts for the legacy of past land uses is more likely to preserve a broad range of wildlife habitat restoration objectives (Allen et al 2002, Fule et al 2004, Kauffman 2004, Schoennagel et al 2004, Noss et al 2006, Kotliar et al 2007).

Landscape distribution is also a factor, and in their evaluation of fire severity and patch size on bird species response, Saab and Powell 2005, found that unburned areas in close proximity to burned areas were needed to serve species dependent upon live woody vegetation, especially foliage gleaners. While some species were more abundant in unburned sites (golden crowned kinglet, mountain chickadee, hermit thrush) and some species more abundant in burned sites (black-backed woodpecker, olive-sided flycatcher, three-toed woodpecker, mountain bluebird), a mixture of burned and unburned forest provides habitat for a wide variety of species. Some species that frequently nest in large dead trees but forage in live trees for seeds such as the white-headed woodpecker benefit from the mosaic of live and dead trees created by low and mixed severity fires (Saab and Powell 2005). Conversely, habitat for species that prefer or require closed-canopy mature forest conditions would be reduced on the areas that are intensively burned.

While proposed mixed severity burning would create openings within existing forest, approximately 20 percent of the burn unit would be unaffected and existing canopy conditions would be maintained on another 50 to 55 percent. As a result forest habitat would not be isolated due to the creation of openings, and connectivity would be maintained. Also treatments would create landscape conditions characteristic of historic conditions.

Low and Mixed Severity Burning Summary

Effects of proposed broadcast burning (low and mixed severity fire) on wildlife habitat vary by forest community (e.g., lodgepole, mixed conifer and ponderosa pine), as well as by fire return interval (Saab and Powell 2005). Many western conifer forests were historically affected by frequent, low to mixed severity fires (Amacher et al. 2008), therefore, native species are adapted to historical fire regimes and the resulting habitats (Saab and Powell 2005). While treatment would reduce habitat for some species and benefit others, fire management that includes a broad range of variability, including areas of more severe fire, are more likely to preserve a broad range of wildlife habitat than restoration with narrowly defined historic fire regimes (Allen et al. 2002 *in* USDA Forest Service 2006b; Fulé et al. 2004, Kaufman 2004, Kotliar et al. 2007, Noss et al. 2006, Schoennagle et al. 2004 *in* Kennedy and Fontaine 2009). Collectively, implementation of the proposed burning, combined with the widespread availability of untreated habitat is expected to result in a more diverse landscape that provides habitat for all species that currently use the project area, as well as improve habitat for species that prefer or require declining fire dependent communities.

Under alternative 3, low- and mixed-severity burning would be reduced by approximately 15 percent (705 acres) from that of alternative 2. While fuels and wildfire risk would not be reduced, open and closed mid- to late-seral forest habitat would be maintained on approximately 141 acres, or the lands affected by higher-severity fire, whereas understories would be unchanged on the deferred low-severity fire sites. Treatment changes under alternative 3 would reduce establishment or restoration of ponderosa pine, aspen and white-bark pine by 1,316 acres, 315 acres and 629 acres respectively, when compared with alternative 2, whereas western larch would increase on 38 acres.

Pile and Burn and Jackpot Burning

This activity involves piling harvest-generated fuels, natural fuels, brush, and heavy accumulations of litter with mechanize equipment such as a tractor-mounted brush rake or a grapple or by hand. Burning usually occurs in the winter when fire danger is low. On some sites burning is allowed to creep away from piles allowing for a small scale underburn. This treatment would also reduce concentrations of natural fuels and those created from harvest activities resulting in predicted fire behavior within desired intensities.

While there is a possibility wildlife could be directly affected by this treatment, the likelihood of mortality is low because of the widespread availability of unburned lands interspersed between burned sites. Like low and mixed severity burning, indirect effects include a reduction in DWD on the site and habitat for species that utilize this component would be reduced. With implementation of pdfs, down woody debris including large-diameter logs would be maintained on site and suitable habitat would continue to be available.

Roads

Roads can affect wildlife in many ways including;

- Direct loss of habitat through a loss of forest cover
- Degradation of habitat quality through increased sedimentation or risk of invasive plants
- Habitat fragmentation including increased edge or a loss of interior habitat
- Avoidance by wildlife sensitive to the disturbance

- Increased mortality associated with hunting or poaching
- Road mortality, or barriers to wildlife movement and dispersal (NRDC 1999)

Conversely, benefits may result to species that utilize the herbaceous vegetation associated with the road right-of-way (ROW).

Road activities including roads built then obliterated immediately following timber removal and road maintenance are identified in table 8. The following is a description of the road treatments and a discussion of the general effects on wildlife, whereas additional road related effects are also addressed in the species-specific analysis.

Roads Built then Obliterated Immediately Following Timber Removal

Direct effects are largely limited to activities that occur to the roadbed and the associated right-of-way (ROW). Roads built then obliterated immediately following timber removal would involve clearing a 20-foot ROW within existing forest, which would result in approximately a 6-acre and 1-acre reduction of forested habitat under alternatives 2 and 3 respectively. It may also include shaping, adding culverts, improving drainage, and applying surfacing material. Effects include a short-term increase in sediment, as well as possible mortality to less mobile wildlife and behavioral avoidance of some species during construction. Potential effects depend in part on the location of the project road corridors. For example, all proposed roads occur within 0.25 mile of an existing road and do not access previously unroaded areas. As a result, the areas affected do not provide preferred habitat for interior species, or species sensitive to disturbance and use associated with roads.

All roads would be closed to public access during project implementation, reducing potential impacts associated with road use including road related mortality, poaching, noise and increased human activity. While roads would be permanently closed following use, by creating a new ROW, some increased human access would be expected to occur. Also low standard roads similar to those proposed have been shown to be barriers to the dispersal of some small mammals, reptiles and amphibians (NRDC 1999); hence, potential effects can be expected to occur on a localized basis for some species. Effects to movement and dispersal are not expected to affect long-term reproduction or local populations due to the small amount of acres affected, proximity to existing roads, and considering proposed roads do not isolate any forest patches.

Road Maintenance

Road maintenance includes shaping the roadbed, adding culverts and/or applying surfacing material. Like road construction, this activity is expected to result in increased sedimentation during activities, although implementation of pdfs would reduce these impacts. Like road construction, effects to wildlife also include possible mortality to less mobile species, as well as behavioral avoidance during maintenance activities. Wildlife related disturbance and mortality would be low because this activity would occur along a narrow strip on existing roads.

Road Management

Many effects to wildlife are determined by road management, or whether a road is open, closed or restricted. The HNF reduces impacts to wildlife by keeping roads into key habitats closed or restricted during critical periods of the year. In addition, all roads used by the project which are currently closed or restricted to meet wildlife or other resource objectives would be maintained in their pre-project status. Further, in order to reduce disturbance-related impacts to wildlife, all roads to be built then obliterated immediately following timber removal would be closed to public access during and following implementation. As a result, the road management strategy in effect is expected to reduce potential road-related impacts to wildlife under both alternatives.

Invasive Weeds

Of the 24 species of noxious weeds found in the State, five are known to occur within the project area including butter and eggs (*Linaria vulgaris*), Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*), St. Johnswort (*Hypericum perforatum*) and spotted knapweed (*Centaurea maculosa*). In addition Common mullein (*Verbascum thapsus*) is listed as a noxious weed by Lewis and Clark County and it is likely that oxeye daisy (*Leucanthemum vulgare* also known as *Chrysanthemum leucanthemum*) and cheatgrass (*Bromus tectorum*) occur along roadways, especially near areas of recent disturbance. There are currently 564 acres of known infestation (USDA Forest Service 2011d).

The Forest weed treatment project FEIS (USDA Forest Service 2006c) provides a detailed discussion on the effects of invasive weeds and their control on wildlife and this information is incorporated by reference into this analysis.

A number of weed prevention project design features are in place to reduce the spread of invasive species during treatment and anticipated effects are discussed in detail in the project invasive weed report (USDA Forest Service 2011d). While the spread of noxious weed would continue under all alternatives, the rate of spread would be expected to be faster in areas proposed for treatment and it is estimated that alternatives 2 and 3 would result in an additional 311 and 233 acres of weed infestation respectively. Combined with known infestations within treatment areas, it is estimated that 653 acres of invasive weeds would occur under alternative 2 and 526 acres would occur under alternative 3.

It is anticipated that a combination of biological and chemical control would be used to control infestations and by year 2 or 3 the project would continue to treat a minimum of 114 acres or potentially more depending on monitoring results. While invasive weeds would continue to spread over time, it is expected that ongoing monitoring and weed control would provide benefits over time through control of existing and new infestations. So while potential effects to wildlife and wildlife habitat from invasive plants would increase under both action alternatives, with implementation of pdfs to reduce weed infestation and monitoring and control treatments to reduce spread, it is expected that any effects would be localized and there would be no large areas of cover or forage affected. Also, effects to sensitive habitats such are riparian areas and wetlands would be reduced due to implementation of INFISH buffers that reduce treatment in these areas. Finally there are no effects to wildlife anticipated that were not considered in the Forest Weed Treatment FEIS (USDA Forest Service 2006c).

Cumulative Effects for All Alternatives

This section summarizes anticipated cumulative effects that would occur under all alternatives and information presented is used in the habitat and species cumulative effects analysis presented in the following sections.

Cumulative effects related to wildlife are evaluated by looking at past, present and foreseeable future activities that could affect wildlife when considered cumulatively over time. When considering cumulative effects to wildlife based on past and anticipated future disturbances, the primary factors of change included timber harvest, wildfire, insects and disease, road construction and management, private land development, grazing and recreational use. A complete list of past, ongoing and future activities that were considered in the cumulative effect analysis, including a discussion of effects to wildlife habitat, can be found in volume 2, appendix C; whereas a general discussion of effects to wildlife and wildlife habitat is provided below.

The cumulative effects boundary used in this analysis varies by species. For example, cumulative effects for species with small home ranges would be analyzed across the project area, whereas some species are analyzed across designated management areas such as lynx analysis units, bear management units, or elk herd units. For species that have large home ranges and select habitat based partially on landscape conditions (e.g., wolverine, gray wolf, fisher, etc.), the cumulative effects analysis area includes the project area combined with adjacent lands affected by mountain pine beetle (MPB) mortality and recent wildfire. This combined area totals approximately 101,977 acres, including 67,042 acres of NFS land, and 34,935 acres of private land. Rationale for selection of this area includes the following:

- This area is large enough to assess effects to species to species with large home ranges, thereby framing the context and significance of potential impacts to each species.
- The cumulative effects area includes more developed private lands adjacent to the project area, which contain habitat components or levels of disturbance that may influence wildlife use of NFS lands.
- This area includes all of the two Elk Herd Units (EHU) and Lynx Analysis Units (LAU) affected.
- This area is large enough to assess landscape-level considerations and connectivity, including potential impacts to affected Bear Management Units (BMUs), EHUs and LAUs.
- Including lands to the north and northwest would tend to dilute effects because of the large amounts of designated Wilderness and Inventoried Roadless Areas.
- The cumulative effects area includes over 20,000 acres that have recently (since 2003) been affected by wildfire, which influences landscape-level use and effects.
- Wildlife habitat conditions and land uses within the area are representative of those found across the larger landscape or watershed(s).

A determination of significance is made for each species/habitat evaluated. For the purpose of this analysis, significant cumulative effects are defined as effects that singly or incrementally could result in long-term impacts to wildlife or wildlife habitat that could result in a loss or reduction in viability (defined above).

Past, Ongoing and Future Activities

Past activities include commercial and non-commercial timber harvest, reforestation treatments, fuel treatments, grazing, mining, special use and outfitter guide permitting, motorized and non-motorized recreational use and wildfire (appendic C). Effects of these activities vary spatially and temporally and while understory cover and forage was reduced immediately following partial harvest, reforestation and fuel treatments, understory structure and resulting cover and forage on many of the sites have been restored. Similarly, overstory conditions on older regeneration harvest sites and sites affected by sanitation and intermediate harvest have closed, whereas more recent treatments (since 2000), continue to have more open overstory conditions. Levels of harvest have been declining. In addition, many of the treatments between 2003 and 2009 were designed to remove fuels and re-establish natural vegetation following wildfire, as indicated by the small amount of harvest and large amount of reforestation treatments.

In addition to management activity, approximately 23,000 acres have been affected by more recent wildfire (2003 to 2009). Most of this occurred as high intensity wildfire associated with the 2003 Snow Talon fire in the Copper Creek and Landers Fork drainages in the northeast corner of the analysis area. Overstory mortality within these drainages was widespread and most of the meadow shrub biophysical setting that exists on the analysis area was created by this event. Understory conditions are somewhat variable and while herbaceous vegetation has become established, woody regeneration is scattered. Also because of the widespread reduction in overstory, many of these lands currently don't provide habitat for species that require high forested cover, or species that require overstory cover in close proximity to forage. Conversely, because of the abundance of snags and downed wood, this area provides habitat many species that utilize dead wood, as well as species such as the black backed woodpecker that prefer post-fire landscapes.

As described in the project silvicultural report (Amell and Klug 2015), insect- and disease activity has been occurring across much of the analysis area and has resulted in widespread overstory mortality. This has increased levels of standing and downed wood, created more open canopy conditions and increased understory development on many sites. Vegetation and habitat changes resulting from past activities are largely reflected in the existing habitat condition discussed throughout this analysis. Also, effects of these activities on wildlife are variable and the methodology section for each species discusses the data source(s) used. Ongoing and future activities are displayed in volume 2, appendix C. Wildfires that occurred within the analysis area in 2011 and 2012 are displayed in the 2010 to present table. Future timber harvest activities proposed under the action alternatives have been grouped into intermediate harvest and regeneration harvest because they have similar effects on wildlife and wildlife habitat,. A brief discussion of the effects of these past, ongoing and future treatments on wildlife follows, whereas more detailed analysis is provided in the individual species/habitat cumulative effects sections.

Cumulative Effects Pertaining to Wildlife

Not all activities result in long-term cumulative effects. For example, areas affected by outfitter guide use, or much of the trail or road maintenance work, does not modify habitat conditions and effects of these activities are short term (a few days per year), whereas activities such as grazing, hazard tree removal, prescribed burning, dispersed recreation, or firewood collection, can have long-term effects. The following is a brief summary of ongoing and future activities on wildlife. Also, it should be noted that a biological evaluation would be completed to assess any future in-stream work or NNIS treatment and potential impacts would be reduced through that process.

<u>Personal Use Firewood</u> – Standing dead trees and downed woody debris would be removed on lands adjacent to roads open to the public. Effects include disturbance during collection, as well as reduced standing and downed wood along open road corridors.

<u>Road Maintenance</u> – This involves re-surfacing, culver replacement, and right-of-way (ROW) maintenance (e.g., brushing) of existing roads. Effects include disturbance during maintenance activities, and periodic removal of woody vegetation and associated wildlife cover along road ROWs. Short-term sedimentation would also occur, although activities would result in a reduction in sediment over the long term.

<u>Mining</u> – Effects include localized disturbance to vegetation, soils, and stream banks. Effects to wildlife include disturbance during mining and a localized reduction in habitat for species sensitive to disturbance.

<u>Outfitter Guide Permits</u> – This includes outfitter and guide special use permits for big game and spring bear seasons and associated day use and overnight camping. Effect include temporary displacement of wildlife from the affected area.

<u>Non-motorized Dispersed Recreation</u> – This includes trail use (e.g., hiking, mountain bikes, stock use) maintenance on approximately 6 miles of hiking trial in the Sauerkraut drainage (outside the project area), use at three dispersed campsites in the northern half or the project area and hunting/fishing use. Effects to wildlife include avoidance of the immediate trail corridor and campground sites by species sensitive to

human disturbance, as well as changes in movement patterns during hunting seasons. Effects also include increased presence of nonnative plant species, particularly at heavy use areas such as trailheads.

Motorized Dispersed Recreation – This includes both road and snowmobile use and occurs largely on the existing road system, although the combined area also contains 15 miles of motorized trail. Because vehicle access in much of the project and combined area is good, effects include increased stress, changes in foraging behavior and use, long-term avoidance of open road corridors, seasonal avoidance along roads open for part of the year, and increased presence of invasive species. This impact is controlled to some extent through area closures, travel management and invasive weed control, which is discussed in the Blackfoot Travel Plan (USDA Forest Service 2012g).

The cumulative effects area contains over 50 miles of snowmobile trail, most of which occur as groomed trails along existing roads, although there are approximately 8 miles of un-groomed trail. Additionally, all of the project area and most of the CE area are open to cross country snowmobile use. Effects of snowmobile on wildlife are discussed in detail in the Blackfoot Travel Plan (USDA Forest Service 2012g) and include increased stress, altered forging behavior and possible disturbance to denning or hibernating individuals. Similar to road related use, this can result in a long-term effects and loss of suitable habitat for species sensitive to disturbance.

Effects of motorized and non-motorized use are evaluated in the Blackfoot Travel Plan, which includes reducing existing snowmobile trails within the cumulative effects area (USDA Forest Service 2012g).

Private Land Development – This includes development for housing in several areas in the vicinity of Lincoln. Effects include increased disturbance and road use and possible displacement of wildlife. Because these lands occur in highly fragmented portions of the analysis area, effects would occur primarily to species that are not sensitive to human disturbance or fragmentation.

Grazing – Grazing has the potential to reduce understory diversity and composition. This could reduce wildlife forage, including both herbaceous and woody vegetation. Overgrazing could also reduce understory vegetative structure and wildlife cover, as well as the diversity of preferred species such as aspen, increase the spread of invasive species, and result in impacts to streams, riparian areas, and water quality. Conversely, managed grazing by livestock can increase the productivity and nutritive quality of forage (Clark et al. 2000).

There is currently one riparian area adjacent to the Pine Grove campground that is receiving multiple impacts from grazing and recreation. Fencing will be installed to alleviate this problem, and it is expected that resource impacts would be reduced. In the Stonewall allotment, conifer encroachment reduced grasses and forbs and has affected use on transitory range. Use on the Keep Cool allotment has not exceeded 25 to 35 percent annually and use of this allotment is considered light to moderate. Also there are established INFISH buffer monitoring sites on Beaver Creek and Keep Cool Creek, which would be implemented in the future to identify and reduce resource impacts. Most of the primary forage areas on the Arrastra allotment occur on leased ground and cattle use on the allotment is strictly drift from these lands (USDA Forest Service 2012b). While continued cattle use is expected to affect wildlife cover and forage, considering that (1) the existing impacts to Beaver Creek would be reduced with approved fencing, (2) use of the area has generally been moderate to light, (3) use is not expected to change but would be modified if necessary to reduce resource impacts, and (4) grazing systems would be designed to be compatible with wildlife needs (USDA Forest Service 2012b), it is expected that wildlife cover and forage conditions would be maintained. Additionally, implementation of pdfs (SILV-1, WL-10, 11, 12) under the action alternatives help ensure that aspen and vegetation diversity is maintained following treatment.

Hazard Tree Removal – Harvest involves removal of dead and dying trees within approximately 100 feet of roads. While snags and future downed woody debris are reduced, treatment includes implementation of Forest Plan standards, which include retention of snags on the site. As a result, a snag and future downed wood component is maintained. Effects to wildlife include disturbance during treatment, a reduction in available snag and den trees, and an increase in herbaceous vegetation along affected roadsides. Due to the proximity to open roads, effects would occur primarily to species that are not sensitive to human disturbance.

Campground Activities – This includes activities associated with campground maintenance and ongoing recreational use. Because of the concentrated human activity, effects are primarily related to disturbance during maintenance and use. Although habitat conditions would be largely unchanged, effects would include a localized long-term reduction in habitat for species sensitive to human activity.

Wildfire – All recent (since 2011) fires burned in a patchy mosaic including some areas of low to moderate burning, as well as areas where the burning intensity was high. Based on assessment of the East Fork fire, which affects the largest area, approximately 60 percent of the recent wildfires burned hot enough to result in overstory mortality, whereas approximately 40 percent were unburned or lightly burned. Effects include a long-term loss of forested cover on 60 percent of the acreage affected and a reduction in habitat for species that require mature forest conditions. Effects on the remaining 40 percent would be similar to those described under low severity burning and would include a reduction in woody vegetation and cover. Wildlife forage would be expected to increase on all of the affected acres within the next 5 to 10 years.

While older wildfires such as the Snow Talon fire (2003) reduced wildlife cover, they also increased herbaceous and woody vegetation on the site. Due to the continued development of understory vegetation, wildlife forage has been and would continue to increase, and it is expected that by the end of the analysis period (2022) suitable habitat for species such as snowshoe hare, and species that utilize forage and low cover would increase. Conversely, habitat for species that require high forest cover would continue to be widely scattered or absent.

Mountain Pine Beetle Mortality – It is expected that MPB mortality would continue to occur with some areas of concentrated mortality. As a result, recruitment of snags and downed wood, including larger diameter trees, would continue to occur across the landscape during the analysis period; whereas habitat for species that require more closed canopy conditions would be reduced.

Blackfoot Travel Management Plans – The Blackfoot Winter Travel Decision was implemented in 2013 and the Blackfoot Non-Winter Travel Decision is anticipated in 2015. Each of the travel plans include a complete analysis of effects to wildlife. Any decision would be consistent with existing regulation and direction related to wildlife. While motorized and non-motorized recreation can adversely affect wildlife, ongoing travel planning efforts would likely be beneficial through modifications to access management and authorized recreational use (USDA Forest Service 2012g).

Invasive Plants Treatment – Treatment of nonnative invasive plants involves both mechanical and chemical treatment of target species, primarily along roads, infested riparian areas and administrative sites. Effects to wildlife include disturbance during treatment, although long-term benefits to native vegetation and associated wildlife cover and forage would occur due to the control or containment of nonnative species.

Prescribed Burning – Effects of burning activities included in the proposed action are described under treatment effects and effects to wildlife vary depending on the type of burning proposed. Pre-approved burning would be similar to low-intensity burning.

Trail Work – These activities would result in some localized tree removal and a loss of understory vegetation on the trail surface. While effects include avoidance of the area by wildlife during construction/maintenance, habitat conditions are largely maintained.

Timber Harvest – Effects of harvest under the action alternatives is discussed in the Alternative Effects section, whereas effects of past harvest are discussed in appendix C. Off-forest harvest would be variable and include localized disturbance during operations, removal of live and dead and dying trees and potential for the spread of invasive species. It is assumed that habitat for species that utilize mature forest would be reduced on the affected acres. Because lands of other ownerships occur at lower elevations in highly fragmented portions of the analysis area, it is not expected that harvest activities would further reduce landscape-level connectivity or adversely affect movement of wildlife species that are sensitive to fragmentation and human activity such as lynx, wolverine and grizzly.

Habitat Effects

This section describes alternative effects on the wildlife habitats associated with the biophysical settings described previously. Direct and indirect effects are evaluated across the Stonewall project area, whereas cumulative effects are evaluated across the combined cumulative effects boundary described above. Table 91 displays the amount of each habitat affected by treatments proposed under the two action alternatives, and this information is used in the evaluation of effects described in the following sections. Collectively the action alternatives strive to restore fire to a landscape that has been affected by years of fire suppression and better mimic ecological processes and reference conditions. Table 92 displays the forested biophysical reference conditions and the conditions that would result under each of the alternatives (USDA Forest Service 2012c).

Table 91. Alternative treatment acres by biophysical setting

Habitat	Area Treated			
	Alt 2		Alt 3	
	Acres	%[1]	Acres	%[1]
Barren 68 acres - (<1%)				
Prescribed Fire	7	10	5	7
Douglas Fir Dry – 5,579 acres (23%)	1,798	32	1,140	20
Intermediate Harvest	187	3	66	1
Prescribed Fire	1,511	27	975	17
Regeneration Harvest	100	2	99	2
Douglas Fir Moist – 5,862 acres (24%)	1,783	30	1,192	20
Intermediate Harvest	50	1	22	<1
Prescribed Fire	1,702	29	1,156	20
Regeneration Harvest	31	<1	14	<1
Mtn. Meadow with Shrub - 678 acres				
Prescribed Fire	75	11	75	11
Mtn. Shrubland - 138 acres				
Prescribed Fire	18	13	18	13
Ponderosa Pine/Douglas-fir – 7,742 acres	3,821	49	3,077	39
Intermediate Harvest	1,849	23	1,350	17
Prescribed Fire	1,134	15	1,023	13
Regeneration Harvest	838	11	704	9

Habitat	Area Treated			
	Alt 2		Alt 3	
	Acres	%[1]	Acres	%[1]
Lower Subalpine Forest – 3,331 acres				
Prescribed Fire	890	27	887	27
Upper Subalpine Forest - 580 acres				
Prescribed Fire	125	21	125	21

[1] Percent of the biophysical setting within the project area

Table 92. Forest biophysical setting seral conditions by alternative

Biophysical Setting	Early-seral			Mid-seral Closed			Late-seral Closed			Mid-seral Open			Late-seral Open		
	Alternative			Alternative			Alternative			Alternative			Alternative		
	1[1]	2	3	1[1]	2	3	1[1]	2	3	1[1]	2	3	1[1]	2	3
Dry Douglas-fir	2 (15)	7	6	31 (25)	21	25	55 (15)	41	47	4 (20)	12	8	8 (25)	19	14
Ponderosa Pine Douglas-fir	1 (15)	14	11	31 (10)	16	20	67 (10)	35	45	0 (25)	11	7	1 (40)	24	16
Douglas-fir Moist	1 (15)	6	4	35 (25)	22	27	50 (15)	39	42	5 (20)	14	11	10 (25)	18	16
Lower sub-alpine fir	1 (20)	5	5	21 (40)	15	15	46 (25)	37	37	7 (10)	12	12	25 (5)	32	32
Upper sub-alpine fir	0 (20)	3	3	22 (25)	21	21	46 (15)	38	38	11 (25)	11	11	22 (15)	27	27

[1] – Reference conditions shown in parenthesis

Dry Forest Habitats

Table 93 displays wildlife species that would likely be associated with mid- to late-seral communities resulting under the alternatives considered and this information is used in part to assess changes in wildlife use.

Table 93. Dry forest wildlife habitat summary by alternative

Species Status	Species Likely to Occur within Mid to Late Seral Closed or Open Canopy with Dense Conifer Understory	Species Likely to Occur within Mid to Late Seral Open Canopy stands with Grass/ Forb/ Shrub Understory
Species Likely to be Abundant or Relatively Common	red-breasted nuthatch, pine siskin, mountain chickadee, ruby-crowned kinglet, dark-eyed junco, yellow-rumped warbler, Clark's nutcracker, red squirrel, deer mouse, mule deer, porcupine	red-breasted nuthatch, pine siskin, dark-eyed junco, mountain chickadee, yellow-rumped warbler, American robin, Clark's nutcracker, red crossbill, western wood-pewee, chipping sparrow, deer mouse, dusky flycatcher, mule deer, elk, coyote
Species Likely to be Present but Less Common	white-breasted nuthatch, Townsend's solitaire, hairy woodpecker, red crossbill, gray jay, evening grosbeak, blue grouse, American robin, northern redback vole, dusky flycatcher, elk, coyote, ruffed grouse	white-breasted nuthatch, Townsend's solitaire, hairy woodpecker, gray jay, evening grosbeak, blue grouse, western tanager, mountain bluebird, common flicker, pygmy nuthatch, lark sparrow, tree swallow, violet-green swallow, vesper sparrow, mourning dove, red-tailed hawk, red squirrel, mountain cottontail, yellow pine chipmunk, Richardson's ground squirrel, badger,

Species Status	Species Likely to Occur within Mid to Late Seral Closed or Open Canopy with Dense Conifer Understory	Species Likely to Occur within Mid to Late Seral Open Canopy stands with Grass/ Forb/ Shrub Understory
		northern pocket gopher, red fox, porcupine, gopher snake
Species of Special Concern	northern goshawk, pileated woodpecker, western toad, wolf	flammulated owl, northern goshawk, pileated woodpecker, western toad, wolf
Priority Species	chipping sparrow, blue grouse, pileated woodpecker, red crossbill, Cassin's finch	flammulated owl, chipping sparrow, blue grouse, pileated woodpecker, Lewis's woodpecker, red crossbill, Cassin's finch
Featured Species	elk, mule deer, moose, ruffed grouse	elk, mule deer, moose, ruffed grouse

Alternative 1

Direct and Indirect Effects

No treatments are proposed in the dry forest wildlife habitat, therefore no direct effects are anticipated. When compared against reference conditions, early seral forest would continue to be well below desired conditions , whereas closed-canopy seral forest would continue to be over-represented and open-canopy mid- to late-seral forest would continue to be under-represented.

Restoration activities would not be implemented and existing ponderosa pine would continue to be lost due to ongoing MPB mortality; trends toward Douglas-fir- and sub-alpine fir-dominated stands would continue. Habitat for open-canopy mid- to late-seral ponderosa pine-associated species including the flammulated owl, Cassin's finch, and Williamson's sapsucker would continue to decline, whereas habitat for closed-canopy mid- to late-seral mature forest species, as well as species that utilize dead wood, would continue to increase over time. Snag densities including a component of large- diameter ponderosa pine snags would remain high for 10 to 20 years. The availability of large-diameter snags would decline after this period as existing snags fall to the ground, and ponderosa pine may not become established in the understory. Disturbance agents would continue to increase, generally outside the natural variability.

The likelihood of stand-replacing wildfire is highest under this alternative because stand density would continue to increase and fuel loading would remain high or increase.

Cumulative Effects

Past, present and anticipated future cumulative effects considered in this analysis are described in volume 2, appendix C. As described under methodology, cumulative effects are evaluated across the combined boundary, of which dry forest makes up 41 percent of the analysis area where biophysical data is available. Past timber harvest has reduced ponderosa pine, as well as dry forest old-growth habitat within the analysis area. Past regeneration harvest has affected approximately 20 percent of the dry forest community, although most of this occurred prior to 1980 and many of these stands are now characterized by closed-canopy conditions. Approximately 5 percent has been affected by partial harvest, most of which has involved sanitation cutting and these stands are characterized by more open stand conditions, many of which are characteristic of this community. Fuel treatments have also occurred on another 5 to 10 percent, although understory conditions have largely been restored. Wildfire has affected approximately 5,000 acres and much of the recent timber harvest has been focused on establishing natural regeneration on lands affected by fire. Many of the past and ongoing activities such as trail and campground activities would result in minor and localized changes in vegetation. Personal use firewood would reduce levels of downed woody debris along open roads. Ongoing and future activities that would likely modify dry forest habitat and result in changes in structure or diversity include the following:

- Prescribed fire – 113 acres
- NNIS treatment on 2,120 acres
- Grazing – 8,136 acres,
- Hazard tree removal- 460 acres
- Timber harvest on 241 acres
- Wildfire – 44 acres.

Collectively, these treatments would affect approximately 11,000 acres or 38 percent of the dry forest community within the analysis area. However, not all activities would have adverse effects to this community since NNIS treatment would reduce impacts associated with nonnative invasive species and prescribed fire would be expected to restore conditions. Grazing would be expected to modify understory diversity within this community, although monitoring is in place to identify and mitigate resource concerns associated with grazing. Firewood collection would remove downed woody debris along open road corridors and this could be expected to continue over the long term. Activities that would result in long-term changes in stand structure include timber harvest, hazard tree removal and past wildfire. Collectively this would affect approximately 6,000 acres of the dry forest community. Additionally MPB mortality would continue with some areas of concentrated mortality.

While wildlife would continue to be affected by ongoing and future activities, existing uses (e.g., grazing and recreation) are not expected to change. Nonnative invasive species treatments and prescribed fire treatments would help to maintain or promote desired vegetation. In addition, over 75 percent of the dry forest community would be unaffected by ongoing or future activities and therefore, would not alter the availability of dry forest habitat.

Irreversible or Irretrievable Commitments

There are no irreversible commitments to the dry forest community under this alternative. While there are no irretrievable commitments that can be reasonably predicted at a single point in time, there would be a long-term decline in species diversity and canopy conditions characteristic of the dry forest community, including a reduction in habitat for species that prefer or require large diameter snags. Some wildlife associated with the dry forest community may continue to decline.

Alternative 1 Conclusions

While there would be little short-term change in dry forest habitat, in the absence of fire, existing ponderosa pine would continue to be lost due to MPB mortality and encroachment of shade-tolerant species in the understory. Habitat for closed-canopy species and species that prefer dense understory conifers would increase, whereas open-canopy species would continue to decline. Departure from reference conditions would remain moderate to high and the risk of stand-replacing wildfire would remain high.

Alternative 2

Direct and Indirect Effects

Approximately 58 percent of the dry-forest setting would not be treated and effects on these lands would be similar to those described under alternative 1. Alternative 2 is designed to reduce tree density and/or return stands to earlier seral stages and promote stand sustainability and resiliency through timber harvest and prescribed fire. Treatments, including 2,974 acres of commercial and non-commercial timber harvest and 2,645 acres of prescribed burning would be implemented. These treatments would result in changes displayed in table 91and overall treatment under this alternative would bring project area vegetation closer to reference conditions for all structural stages.

Effects on wildlife would mimic the changes in seral conditions. For example habitat would be improved for species that utilize open canopy forest conditions such as flammulated owl, Lewis's woodpecker and Cassin's finch, whereas habitat would be reduced for species that utilize closed canopy seral stages such as fisher or goshawk (nesting habitat). Effects of treatments on structure and species composition are discussed under treatment effects and in addition to overstory changes (see table 91) include a reduction in understory cover for species such as elk, and snowshoe hare, as well as migratory birds that utilize woody understory vegetation. Conversely, grasses and forbs would increase within one to two years of treatment and forage for species such as elk or ground foraging birds would be improved, whereas habitat for shrub dependent species would be restored within 10 to 15 years.

Changes in hard and soft mast would be variable Mast in the form of conifer seed would be reduced due to improvement cutting, regeneration harvest and portions of mixed severity burning sites that receive high severity fire. Soft mast (e.g., berries) would increase within a few years of treatment (USDA Forest Service 2000b) and be maintained over the long term (i.e., greater than 10 years). While there would be a reduction in mast within treatment sites, due to improved species diversity (i.e., increased aspen, ponderosa pine, and western larch), over the long term it is expected that mast availability would be increased within treated stands as well as across the landscape.

Some snags would be removed within harvest sites, although with implementation of PDF's snags in a variety of size classes, including larger diameter snags would be retained. Similarly, while harvest and fuel treatments would reduce downed wood, between 5 and 20 tons per acre of downed wood would be retained in dry forest sites, including large diameter logs. As a result and considering that burning would increase snags and future recruitment of dead wood, and that approximately 20 percent of the prescribed fire sites would be unburned, dead wood habitat would continue to be available within all stands.

Collectively, activities proposed under alternative 2 would maintain or increase species such as ponderosa pine, aspen and western larch and increase species diversity, In addition to stand-level changes, treatment would also create a more heterogeneous landscape that more closely represents reference conditions and the associated wildlife species.

Alternative 3

Direct and Indirect Effects

Approximately 68 percent of this community would not be treated and effects to that area would be similar to those described under alternative 1. Alternative 3 also moves early, mid and late seral habitat closer to reference conditions, but at a reduced level from alternative 2. A total of 2,219 acres of commercial and precommercial harvest and 1,998 acres of prescribed fire treatments would be implemented.

Effects to wildlife would be similar to those described under alternative 2, in that the project area would move closer toward reference conditions and the associated wildlife species. However due to reduced timber harvest and mixed severity burning, there would be less of a reduction in mid to late seral closed canopy habitat, and less of an increase in early and open-canopy mid- to late-seral habitat. Alternative 3 would also maintain or increase ponderosa pine, aspen and western larch, but at a reduced level. Like alternative 2, alternative 3 would create a more heterogeneous landscape that more closely represents reference conditions and the associated wildlife species

Alternatives 2 and 3

Cumulative Effects

In addition to cumulative effects described under alternative 1, implementation of the action alternatives would result in up to (alternative 2) the following:

- Intermediate Harvest – 2,036 acres
- Regeneration Harvest – 938 acres
- Prescribed Fire – 2,645 acres

Mature forest would be reduced on the acres proposed for regeneration harvest and on approximately 275 acres proposed for mixed severity burning, due to fire-created openings. While ongoing and anticipated future activities would affect up to (alternative 2) approximately 20 percent of the dry forest habitat, mid- to late-seral habitat would continue to predominate and activities would move the project area closer to reference conditions. Regeneration treatments are proposed in areas with concentrated mortality. While mature forest would be reduced, over the long term treatment is expected to help maintain ponderosa pine on the sites. Most anticipated activities are designed to restore historic conditions, and considering closed-canopy mid- to late-seral habitat would continue to predominate, the availability of dry forest habitat would be maintained or improved

Irreversible or Irretrievable Commitments

There are no irreversible commitments to wildlife under any alternative. While the action alternatives would reduce snags and DWD and modify understory and overstory structure and species composition, these habitats would continue to be available across the landscape. Due to fire restoration and reduced conifer encroachment, habitat for species that prefer or require the dry forest community would be maintained or improved over the long term.

Action Alternative Conclusions

Alternatives 2 and 3 would reduce closed-canopy, dry, seral forest by approximately 24 percent and 14 percent respectively, although closed-canopy conditions would continue to predominate across the project area (i.e., greater than 60 percent). Open-canopy mid- to late-seral habitat would be increased by 51 percent and 32 percent under alternatives 2 and 3 respectively, and both alternatives would move the project area closer to reference conditions for all structural classes. Treatments under the action alternatives are expected to re-introduce fire to the landscape, promote fire-tolerant species, (including ponderosa pine, aspen and western larch), provide long-term habitat for species that prefer or require large-diameter snags, and reduce the risk of stand-replacing wildfire. Collectively this is expected to help ensure the long-term sustainability of the dry forest community.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan Standards applicable to management of dry forest habitat is included in the respective management area direction that pertains to the maintenance of big game forage and cover, as well as improvement of non-game habitat in MA W-1. Effects to big game habitat are described under the elk and mule deer environmental effects sections, whereas non-game habitat is discussed under migratory birds and the individual species sections. Big game cover and forage would be maintained in the short term under all alternatives, and improved over the long term under alternatives 2 and 3, therefore, both alternatives are consistent with Forest Plan direction related to big game. All alternatives would maintain or improve habitat for migratory birds, sensitive species, birds of conservation concern and non-game MIS species, therefore, all alternatives are consistent with Forest direction to promote nongame habitat. Finally, because proposed actions would help ensure that this community and the wildlife species that rely on it are sustained over time, both action alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26)

Cool-moist Forest Habitat

Alternative 1

Direct and Indirect Effects

There are no treatments proposed in this alternative, so there would be no direct effects. In the short- and long-term stands would continue to progress successionally with continuing decreases in seral species (ponderosa pine, whitebark pine, aspen, and Engelmann spruce) and increases in climax species(Douglas fir and sub-alpine fir). In the absence of fire, stands would continue to become more homogeneous with closed-canopy conditions predominating and the availability of open-canopy, early and mid- to late-seral habitat would remain low.

The dense stand conditions resulting under this alternative would provide cover for a variety of species including snowshoe hare, deer, and elk. A variety of bird species and small mammals (e.g., squirrels and marten) also seek food, cover and nest sites within dense mature forests. Conversely, herbaceous vegetation and shrubs as well as wildlife forage would continue to decline, as would habitat for species that utilize open-canopy, mid- to late-seral forest conditions. As succession continues, the project area landscape would become more homogenous, reducing habitat for species that utilize a diversity of age classes and seral habitat conditions..

Due to the continued increase in fuels, the likelihood of stand-replacing wildfire would increase. Should a wildfire occur, a long-term decrease in the availability of mid- to late-seral would occur, whereas early-seral habitat would increase. Under either scenario (no fire or stand-replacing wildfire), cool-moist forests would continue to decline in species and structural diversity and deviate from historical conditions, although the availability of snags and DWD would continue to increase.

Cumulative Effects

Past, present and anticipated future cumulative effects are described in appendix C. Since 1960, regeneration harvest has occurred on approximately 950 acres or 4 percent of this community, whereas partial harvest (e.g., thinning, sanitation and improvement cuts) has occurred on approximately 125 acres. Approximately 2,600 acres or 11 percent of this community has been affected by fuel treatments since the late 1950s. Effects of on vegetative structure and habitat from these activities were considered when evaluating the existing condition. Most activities occurred prior to 1980, so by now, understory structure has been restored on many of the sites. More recent wildfire (since 2003-2009) has affected approximately 5,500 acres of this community. While understories have started to become re-established and created elevated levels of wildlife forage, with the exception of large quantities of standing and downed wood, cover on many of these lands is still low.

Ongoing and future activities under this alternative within the cool-moist community include, NNIS treatment on 502 acres, road hazard tree removal on approximately 15 acres, grazing on 1,712 acres, burning on an estimated 178 acres, and 587 acres affected by 2011 wildfires. Collectively, these treatments would occur on approximately 3,000 acres and affect approximately 14 percent of the cool-moist forest community within the analysis area. This would include a long-term reduction in mature forest on approximately 370 acres. Mortality due to stand overstocking and MPB would continue.

While long-term changes in vegetation and structure have altered habitat conditions within this community, ongoing uses (e.g., grazing and recreation) are not expected to change, and approximately 75 percent of the community would be unaffected by ongoing and future activities. Because most anticipated activities are designed to restore historic conditions, and considering closed-canopy, mid- to late-seral habitat would continue to predominate, the availability of these biophysical settings would be maintained.

Irreversible or Irretrievable Commitments

There would be no irretrievable commitments to wildlife under this alternative. As in the dry forest setting, while there are no irreversible commitments that can be reasonably predicted at a single point in time, there would be a long-term decline in habitat for some species that require open-canopy conditions characteristic of this community, including a reduction in habitat for species that prefer or require large diameter snags.

Alternative 1 Conclusions

Alternative 1 would maintain the current distribution of cool-moist forest seral stages. Species composition would continue to decline, structural diversity would remain low and risk of wildfire would continue to increase.

Alternatives 2 and 3

Direct and Indirect Effects

Much of this community is remote with little access, therefore, proposed timber harvest would occur on less than 1 percent of this setting under either alternative. Proposed treatments would result in a small increase in open-canopy, mid-seral habitat (improvement cutting and precommercial thinning) and early seral habitat (regeneration cutting). Both alternatives also propose a small amount of low-severity fire including 50 acres under alternative 2 and 30 acres under alternative 3. Effects of treatment would be similar to those described under treatment effects and under dry forest setting.

Mixed-severity fire was the primary disturbance regime in the cool-moist community; as a result, over 95 percent of the treatment under both alternatives includes restoring mixed-severity fire to the landscape. Under alternative 2, mixed-severity fire would occur on 28 percent of this type, whereas alternative 3 would restore fire on 22 percent. Treatments would create more open-canopy conditions with increased herbaceous understory diversity on much of the acreage treated, as well as small (less than 5 acres) to medium (up to 75 acres) pockets of early seral habitat on sites receiving a mixed-severity prescribed burn.

Changes in wildlife would be similar to those described under the dry forest setting, including a reduction in habitat for species that prefer closed-canopy conditions with a dense understory, and an increase in habitat for species that utilize open-canopy, mid- to late-seral and early seral habitat. While wildlife use would change as a result of changes in cover and forage, treatment would promote the structural diversity characteristic of these biophysical settings while leaving approximately 75 percent unaffected, therefore, habitat would continue to be available to support local populations in the short and long term.

Cumulative Effects

In addition to effects described under alternative 1, implementation of the action alternatives would result in up to (alternative 2) the following:

- Prescribed Fire – 2,602 acres

- Intermediate Harvest – 50 acres
- Regeneration Harvest – 31 acres

Cumulatively ongoing and anticipated future activities would affect approximately 5,700 acres or 26 percent of the cool-moist community, including a reduction in mature forest conditions on approximately 900 acres or 4 percent of this community (due to wildfire, regeneration harvest, hazard tree removal and openings created by mixed severity burning). While treatments would reduce mature forest, treatment would help to restore open-canopy, moist Douglas fir forest, while maintaining a predominance of closed-canopy mid- to late-seral forest. Approximately 74 percent of these biophysical settings would be unaffected, and a variety of habitat conditions would continue to be available..

Irreversible or Irretrievable Commitments

There are no irreversible commitments anticipated. The action alternatives would reduce snags and DWD, and modify understory and overstory structure and species composition, including a reduction in mature forest; however, these habitats would continue to be available across the landscape. Due to fire restoration and reduced conifer encroachment, habitat for species that prefer or require the open-canopy or early seral cool-moist forest community would be restored and increased.

Action Alternative Conclusions

Alternatives 2 and 3 would affect approximately 2,673 and 2,079 acres of the cool-moist communities respectively. Both alternatives would reduce available closed-canopy habitat and increase early and open-canopy habitat. Overall, proposed treatments would move vegetation closer to reference conditions for the Dry Douglas-fir biophysical setting, promote stand- and landscape-level structural diversity, and increase ponderosa pine, western larch, whitebark pine and aspen. Wildlife habitat diversity would be maintained in the short term and improved over the long term

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan Standards applicable to management of cool-moist habitat is included in the respective management area direction that pertains to the maintenance of big game forage and cover, as well as improvement of non-game habitat in MA W-1. Effects to big game habitat are described under the elk and mule deer environmental effects sections, whereas non-game habitat is discussed under migratory birds and the individual species/habitat sections. Because big game cover and forage would be maintained in the short term under all alternatives, and improved over the long term under alternatives 2 and 3, all alternatives are consistent with management area direction related to big game. Additionally, because all alternatives would maintain or improve habitat for migratory birds, sensitive species, birds of conservation concern, and non-game MIS species, all alternatives are consistent with MA W-1 direction to promote non-game habitat. Finally because both action alternatives would restore fire to the landscape, improve species composition, and promote long-term sustainability of this community, both action alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26).

Upper Sub-alpine Fir (Whitebark Pine)

Alternative 1

Direct and Indirect Effects

There are no treatments proposed for this alternative, so there are no direct effects. However due to the absence of fire, continued insect- and disease-related mortality and conifer encroachment, both stand- and landscape-level whitebark pine would continue to decline. As a result, habitat for species such as grizzly bear, red squirrel and Clark's nutcracker, as well as many mammals and birds that utilize its seeds may decline. Due to elevated levels of fuels, wildfire risk would remain high.

Cumulative Effects

Past, ongoing and anticipated future cumulative effects are in volume 2, appendix C. Because this habitat is found at upper elevations, there have been few past activities, which have consisted of approximately 30 acres of timber harvest and fuel treatment and 200 acres of reforestation since 1960. More recent wildfire has also occurred on approximately 200 acres. Ongoing and anticipated future activities are limited largely to firewood collection and 32 acres of recent (2011) wildfire. Collectively, approximately 20 percent of this community has been affected, although vegetative structure and habitat from most past activities have been restored (appendix C). While there would continue to be a reduction in whitebark pine, because over 80 percent of this community has been unaffected.

Irreversible or Irretrievable Commitments

There would be no irreversible commitments under this alternative. While there are no irretrievable commitments that can be reasonably predicted at a single point in time, in the absence of wildfire, whitebark pine would continue to decrease.

Alternative 1 Conclusions

Whitebark pine is a fire-dependent species and fire suppression would continue to occur; therefore, risks of stand-replacing wildfire would continue to increase and the current decline in whitebark pine is expected to continue. Over the long term, suitable habitat for species such as the grizzly bear that rely on whitebark pine would be further reduced.

Alternatives 2 and 3

Direct and Indirect Effects

Both action alternatives propose approximately 125 acres of mixed-severity fire, as well as supplemental planting of whitebark pine in select stands proposed for harvest. As described under treatment effects, mixed-severity fire would result in a mosaic of low intensity burning conditions, high severity burning conditions, and unburned areas. As a result, early seral habitat would be created on approximately 20 percent of the acreage treated or 8 percent of the existing upper sub-alpine fir community, whereas 80 percent of this community would be unaffected (includes unburned portion of treatment units).

While effective treatments to restore whitebark pine are still being researched, based on the available information (USDA Forest Service 2010a; PIF 2000), the mix of treatments proposed, including pre-burning fuel enhancement and prescribed fire are the primary tools available for treating deteriorating whitebark pine stands and restoring this important species across the landscape. Because it may take decades to establish pine seedlings on the site (USDA Forest Service 2010a), it is important to maintain existing regeneration and available seed sources. Consequently, maintenance and regeneration of whitebark pine would be promoted in all units through a combination of planting and site preparation in harvest units, as well as through landscape burning using low- and mixed-severity fire. All units would be evaluated prior to burning to protect existing whitebark pine seedlings, and identify areas where pre-burn treatments can be applied to promote future regeneration from nutcracker caching. While research indicates that the mix of proposed treatments may be effective at development of nutcracker caching sites, because of the complexity of whitebark pine regeneration, it is expected that it may take at least 10 to 20 years for regeneration to become established (USDA Forest Service 2010a). While both alternatives would promote restoration of whitebark pine, there are no short-term benefits and benefits associated with regeneration and restoration of pine would be long term.

Maintenance of whitebark pine has important implications for wildlife because of the reliance of grizzly bears on whitebark pine nuts in some ecosystems (Mattson and Jonkel 1989, Mattson et al. 1992 in PIF 2000). Whitebark pine seeds are also an important food source for many small mammals and bird species. Red squirrels (*Tamiasciurus hudsonicus*), chipmunks (*Eutamias spp.*), and golden-mantled ground squirrels (*Citellus lateralis*) are known to forage on whitebark pine seeds, with red squirrels demonstrating a high dependence on whitebark pine in subalpine habitats (Hutchins 1989 in PIF 2000). Whitebark pine is also used for foraging by a number of bird species and Clark's nutcrackers are highly dependent on whitebark pine seed in the late summer and fall of each year, utilizing the seed caches throughout the winter (PIF 2000). Whitebark pine benefit directly from a mutual relationship with Clark's nutcrackers through enhanced dispersal and seeding success resulting from germination of un-retrieved nutcracker caches (Tomback 1982 *in* PIF 2000). Consequently promoting the long-term restoration of whitebark pine, would improve habitat for a variety of mast- dependent wildlife.

Cumulative Effects

In addition to effects described under alternative 1, both action alternatives propose prescribed fire on 125 acres of the upper sub-alpine community. Because existing whitebark pine would be protected and considering that proposed burning is expected to maintain or restore whitebark pine, while leaving 80 percent of this community unaffected, suitable habitat would continue to be available in the short and long term.

Irreversible or Irretrievable Commitments

There are no irreversible commitments under these alternatives. Because proposed treatments would reduce snags, DWD and modify overstory and understory structure, there would be shifts in available mature and early seral upper sub-alpine fir habitat. However, due to anticipated whitebark pine regeneration over the long term, treatments are expected to promote the long-term sustainability of this forest community and the wildlife species that depend on it.

Action Alternative Conclusions

Based on available information, treatments proposed under the action alternatives are expected to promote conditions necessary to maintain whitebark pine across the landscape. Habitat would be improved for grizzly bear and Clarks nutcracker, as well as for species that rely on hard mast in this important community.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan Standards applicable to management of upper sub-alpine habitat is included in the respective management area direction that pertains to the maintenance of big game forage and cover, as well as improvement of non-game habitat in MA W-1. Effects to big game habitat are described under the elk and mule deer environmental effects sections, whereas non-game habitat is discussed under migratory birds and the individual species/habitat sections. Because big game cover and forage would be maintained in the short term under all alternatives, and improved over the long-term under alternatives 2 and 3, all alternatives are consistent with management area direction related to big game. Additionally, because all alternatives would maintain or improve habitat for migratory birds, T&E, and sensitive species, all alternatives are consistent with MA W-1 direction to promote non-game habitat. Finally, because of the importance of white-barked pine for grizzly bear, and a variety of other wildlife, both action alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26).

Riparian Habitats

Alternative 1

Direct and Indirect Effects

There are no treatments proposed for this alternative, so riparian habitats would be largely unchanged. Over the long term, species and structural changes described under alternative effects would continue to occur. There is mounting evidence that simply protecting riparian areas from fire and other disturbances may result in deterioration of habitat for wildlife (USDA Forest Service 2000b). For example, without low-intensity fire, uplands and streamside areas succeed to shade-tolerant coniferous species, with reduced dominance or loss of early successional deciduous trees and shrubs. These altered conditions can have important consequences for habitats of terrestrial and aquatic fauna (USDA Forest Service 2000b). Further, because of elevated levels of fuel loading, riparian areas and the species that depend on them would continue to be at risk from stand-replacing wildfire.

Cumulative Effects

While there has been a small amount of timber harvest and fuel treatments within riparian areas since 1960 (less than 100 acres), riparian habitat has been largely unchanged from treatment. An exception would be the Copper Creek and Lincoln Gulch drainages, where wildfire has greatly reduced forested riparian habitat.

Ongoing and future activities that occur within riparian habitat include grazing, a small amount of NNIS treatment (10 acres), and a small amount of burning associated with future prescribed fire. Fire is only allowed to back into riparian areas and with implementation of design features to reduce burning intensity, most of the riparian areas would be unburned or lightly burned.

While wildfire has altered riparian habitat in the Copper Creek/Lincoln Gulch drainages, riparian habitat outside these areas and across most (over 75 percent) of the analysis area is expected to be maintained.

Irreversible or Irretrievable Commitments

While there may be a gradual reduction in hardwoods and shrubs due to continued conifer encroachment, there are no irreversible or irretrievable commitments to the riparian community anticipated under this alternative.

Alternative 1 Conclusions

Riparian habitats would be largely unchanged under this alternative, although due to conifer encroachment and continued reduction of aspen, vegetative diversity and structure may be reduced over time.

Alternatives 2 and 3

Direct and Indirect Effects

Based on treatment effects discussed in section 4.3, the action alternatives would result in removal of some mature trees, as well as smaller diameter down woody debris. However, with implementation of pdfs and streamside management zones, very limited harvest would occur. Any burning within riparian areas would be low intensity, and much of the riparian habitat would be unburned or lightly burned. Habitat for riparian-dependent wildlife would be maintained or improved due to increases in herbaceous, woody and hardwood (aspen) vegetation and forage adjacent to and within the riparian community.

Due to reduced fuels in adjacent uplands, the risk of high-intensity wildfire in riparian areas would be reduced.

Cumulative Effects

Cumulative effects include those described under alternative 1, as well some burning that enters riparian areas and limited harvest. Fire would only be allowed to back into riparian areas, with the exception of scattered areas that receive a low-intensity burn, riparian vegetation would be largely unchanged. As a result, and due to the small amount of habitat affected, and considering any burned areas would help to maintain the riparian shrub/hardwood component, riparian habitat would be maintained over the short and long term.

Irreversible or Irretrievable Commitments

While there may be small changes in structure and understory/overstory conditions on a localized basis, there are no irreversible or irretrievable commitments anticipated under the action alternatives.

Action Alternatives Conclusions

While there would be some localized changes in the structure and composition of riparian forest in scattered areas from low-severity burning, both action alternatives would maintain riparian habitat and reduce the likelihood of high intensity wildfire and a reduction in mature riparian forest.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Forest Plan requires that riparian areas be managed to be compatible with dependent wildlife species. Because riparian habitat would remained relatively unchanged under alternative 1 and considering that both action alternatives protect riparian areas, as well as increase the shrub/hardwood component, all alternatives are consistent with this direction, as well as with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26).

Mountain Meadow and Shrub

Alternative 1

Direct and Indirect Effects

There are no treatments proposed for this alternative, so there are no direct effects. In areas where MPB mortality has occurred, shrub and meadows may expand somewhat as the canopy opens. This may benefit some species in the short term, since cover in close proximity to foraging habitat would increase. However, due to the absence of fire and expansion of conifers over the long term, mountain meadow and shrub habitat would decline, resulting in decreased forage and herbaceous/shrub cover. Also, because many shrubs are decadent with little regeneration occurring, the diversity of shrub age classes would continue to decline and the structural diversity important to many bird species that utilize the mountain shrub community would likely be reduced.

Cumulative Effects

Past, ongoing and anticipated future cumulative effects are in volume 2, appendix C. Most of the existing mountain meadow and shrub habitat is a result of recent wildfires (2003 to 2009). Consequently, past activities have largely been associated with fuel reduction and re-establishment of vegetation. Past activities within the small meadow/shrub inclusions that are scattered across the analysis area have included primarily grazing. Ongoing and future cumulative effects include approximately 1,100 acres of continued grazing, 365 acres of NNIS treatment, and 75 acres of wildfire (2011). Cumulatively, approximately 1,550 acres or 11 percent of these communities may be affected. As described in section

4.4, grazing use is not expected to change and NNIS treatment would reduce the spread of invasive species. As a result, habitat conditions would be largely maintained and there are no long-term adverse effects anticipated.

Irreversible or Irretrievable Commitments

While conifer encroachment would continue to reduce mountain meadow and shrub communities, it is likely a wildfire would maintain them in the future and there are no irreversible or irretrievable commitments under this alternative.

Alternative 1 Conclusions

While habitat would be maintained in the short term under this alternative, conifer encroachment would continue to reduce mountain meadow and shrub communities across the project area.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 propose prescribed fire (mixed severity) on 75 acres of meadow habitat (11 percent) and 18 acres of mountain shrub habitat (13 percent). Effects of proposed burning include mortality and a reduction in shrubs, as well as a change in shrub density on the acres treated. There would be mortality in the decadent and mature size class, and burning would result in development of a younger age class or rejuvenate decadent shrubs, as well as increase herbaceous vegetation (Peterson and Best 1987). By killing encroaching conifers, fire has also been found to create habitat diversity in sagebrush by establishing a mosaic of age classes (Young 1983).

Soil disturbance during burning may make meadows more susceptible to weeds, so implementation of burning could lead to increased risk of nonnative invasive plant species.

While treated shrub stands would be more open, with implementationretention of pdfs, burning would occur in a patchy mosaic and 30 to 50 percent of the existing shrubs would be retained. As a result all sites would retain wildlife cover and forage within treatment units. Effects within burned portions of the sites would vary. For example, prescribed burning in Idaho indicated that while there may be a short-term (1 to 2 years) reduction in use for birds such as brewer’s sparrows immediately following burning, some species such as the sage sparrow and sage thrasher are largely unaffected, whereas western meadowlarks increase slightly immediately following burning. Also within 4 years of the burn, total burn densities were higher than on control plots, and densities of Brewer’s sparrow doubled (Peterson and Best 1987).

Big game forage associated with shrubs would be reduced initially following burning, but would be restored within 10 to 15 years. Burning within both mountain meadow and shrub communities would increase herbaceous vegetation, forage availability for species such as elk and mule deer would increase (USDA Forest Service 2006b). Hobbs and Spoward (1984) found that prescribed burning elevated concentration of protein and digestible matter in grassland and mountain shrub communities and improved deer winter range.

In summary, there would be an initial reduction in big game forage on the lands burned, and species diversity and abundance would change following burning. With implementation of pdfs, 30 to 50 percent of the units would be unburned, and in the short term, all sites would continue to provide big game forage and habitat for mountain meadow and shrub-dependent species. Over the long term, treatment would increase big game forage, improve shrub vigor and improve wildlife diversity and abundance and help ensure the sustainability of these communities.

Cumulative Effects

In addition to cumulative effects described under alternative 1, prescribed fire would occur on up to 93 acres (alternative 2). While some shrub mortality would occur, project design features are in place to ensure that some existing shrubs are retained. It is expected that proposed burning would increase shrub vigor and reproduction on treatment sites, whereas 89 percent of these communities would not be treated. Mountain meadow and shrub habitat would continue to be available in the short and long term.

Irreversible or Irretrievable Commitments

There are no irreversible or irretrievable commitments of shrubs and meadows associated with the action alternatives.

Alternative 2 and 3 Conclusions

Alternatives 2 and 3 would result in some mortality of existing shrubs and reduce available cover and forage on portions of the sites treated, and elevate the risk of invasive plants. The risk of nonnative invasive plant species would be reduced through implementation of pdfs (NOX-1-8) and post-treatment monitoring. Habitat for wildlife that depend on shrub and meadow communities would continue to be available since a shrub component would be maintained on all sites (WL-10), and over 80 percent of these communities would not be treated. The health and vigor of native shrubs and grasses would be improved on approximately 15 percent of the available habitat, and conifer encroachment would be reduced. Both alternatives would help promote the long-term sustainability of the mountain meadow and shrub communities.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan Standards applicable to management of mountain meadow-shrub habitat is included in the respective management area direction that pertains to the maintenance of big game forage, as well as improvement of non-game habitat in MA W-1. Effects to big game habitat are described under the elk and mule deer environmental effects sections, whereas non-game habitat is discussed under migratory birds and the individual species sections. Because big game cover and forage would be maintained in the short term under all alternatives, and improved over the long-term under alternatives 2 and 3, all alternatives are consistent with management area direction related to big game. All alternatives would maintain or improve habitat for a variety of nongame species, including bird species of conservation concern, all alternatives are consistent with MA W-1 direction to promote nongame habitat. Finally, because proposed actions would reduce conifer encroachment and improve herbaceous and woody diversity, both action alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26).

Aspen

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct effects. Due to the absence of disturbances such as fire, existing aspen would continue to decline in the short term, and would be largely eliminated in the long term (USDA Forest Service 2010a). Should a wildfire occur, aspen would be rejuvenated and maintained, although the longer it takes for a wildfire to occur, the greater the likelihood that the distribution of aspen may be reduced.

Cumulative Effects

Past, ongoing and anticipated future cumulative effects are in volume 2, appendix C. Past activities have included some timber harvest and wildfire which has helped to maintain aspen, as well as grazing which has reduced aspen in some areas. Ongoing and future cumulative effects include continued browsing by livestock and elk, possible increases in invasive plant species and localized improvements due to burning associated with the Blackfoot and Dry Creek prescribed fires. Grazing use is not expected to change and considering proposed fire would help to maintain aspen in affected drainages, there would be little change in aspen from proposed treatments.

Irreversible or Irretrievable Commitments

There are no irreversible commitments anticipated. While it is likely that future wildfire would maintain an aspen component, due to continued conifer encroachment, aspen may continue to decline.

Alternative 1 Conclusions

Due to the absence of fire and conifer encroachment the aspen community has been declining across the project area. With continued fire suppression, and in the absence of future fire, the amount and distribution of aspen would continue to decline and habitat for species that prefer this community would be reduced over the long term under this alternative.

Alternatives 2 and 3

Direct and Indirect Effects

Successful regeneration of aspen requires disturbance that stimulates sucker regeneration. As a result disturbance associated with prescribed fire and timber harvest proposed under both alternatives would successfully regenerate existing aspen and lands containing an aspen component would be treated on approximately 2,292 and 1,408 acres of alternatives 2 and 3 respectively. While alternative 2 proposes treatment on more acres, pdfs require that aspen be promoted and maintained where it occurs (WL-12). As a result, treatments proposed under both action alternatives are expected to maintain or improve the aspen component (USDA Forest Service 2006b, USDA Forest Service 2000b) on the acres affected. Effects to wildlife include improved habitat for species that prefer or require aspen such as ruffed grouse, deer, elk, and snowshoe hare, as well as a number of nongame species including the olive-sided flycatcher. In addition to improving the amount of aspen, prescribed fire is expected to improve the nutritional quality of forage within 1 to 2 years following treatment (USDA Forest Service 2006b).

Cumulative Effects

In addition to effects described under alternative 1, burning and harvest treatments would occur on approximately 2,300 acres of aspen (alternative 2). Proposed treatments are expected to promote aspen; although continued browsing by livestock and wildlife would occur. Project design features are in place to protect and promote aspen, including potential impacts from livestock grazing. As a result, habitat would be maintained in the short term and improved over time.

Irreversible or Irretrievable Commitments

There are no irreversible commitments anticipated. Because proposed activities are expected to promote the long-term sustainability of aspen, there are no irretrievable commitments on the acreage treated. Like alternative 1, aspen would continue to decline where it exists outside of treatment areas.

Alternative 2 and 3 Conclusions

Implementation of alternatives 2 and 3 would result in the reduction of scattered mature aspen due to proposed burning, whereas, proposed treatments are expected to promote existing aspen by reducing conifer encroachment and stimulating regeneration. Over the long term, proposed treatments are expected to promote the distribution and sustainability of the aspen community across the project area.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan Standards applicable to management of aspen is included in the respective management area direction that pertains to the maintenance of big game forage, as well as improvement of non-game habitat in MA W-1. Effects to big game habitat are described under the elk and mule deer environmental effects sections, whereas non-game habitat is discussed under migratory birds and the individual species sections. Big game cover and forage would be maintained in the short term under all alternatives, and improved over the long term under alternatives 2 and 3; all alternatives are consistent with management area direction related to big game. All alternatives would maintain or improve habitat for a variety of non-game species, therefore, all alternatives are consistent with MA W-1 direction to promote non-game habitat. Finally, because both action alternatives would help to retain aspen across the landscape, both action alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26).

Dead Wood

Alternative 1

Direct and Indirect Effects

There are no treatments proposed for this alternative, so there are no direct effects. However, habitats would continue to change and result in effects to wildlife habitat. For example, risks associated with disturbance such as wildfire, root disease and insects would likely increase as forested stands become denser and more susceptible to these agents. As a result, standing dead and DWD would continue to be available and provide habitat for wildlife dependent on snags and down wood. While the availability of large-diameter snags would remain high for the next 10 to 20 years, as snags fall to the ground and the availability of large-diameter trees (i.e. ponderosa pine) is reduced over time, the availability of large-diameter snags is expected to decline.

Historically, wildfires included a combination of low, mixed and high-severity fires where some snags and large DWD were maintained or increased across the landscape (low- and mixed-severity fires). Increasing levels of dead wood and ladder fuels leave the project area susceptible to increased, severe stand-replacing wildfire, and reduce the likelihood of low-severity fires.

Standing and downed, dead trees have many ecological roles in a landscape recovering from wildfire (Beschta et al. 1995, Saab and Dudley 1998, Smith 2000, Brown et al. 2003, Beschta et al. 2004, Saab et al. 2004 in USDA Forest Service 2008a). The snags and down logs that result from fire serve a vital role in the structure and function of healthy forest ecosystems and play an important role in post-fire recovery and long-term site productivity. Also Hutto (1995) found that 15 species of birds were more frequently found in post-fire habitats than in any other major cover type in the northern Rockies. As a result, and considering that the possibility of stand-replacing wildfire is highest under this alternative, the likelihood that habitat would be provided for these species is high. Conversely, because of the large acreage burned, habitat for some species that utilize dead wood within a live forest canopy such as mountain bluebirds or Lewis's woodpecker would be reduced (Saab et al. 2007).

Cumulative Effects

Cumulative effects are evaluated across the combined boundary and past, ongoing and anticipated future effects are in volume 2, appendix C. Many past activities have reduced standing and downed wood. While activities since 1986 have maintained a dead wood component, many of the snags retained have since fallen to the ground. As a result, post treatment snag estimates assume that these sites do not contain snags. Conversely, past MPB mortality, as well as wildfire has greatly increased the amount and distribution of snags and downed wood.

Potential ongoing and future cumulative effects include a reduction in dead wood along open roads due to firewood collection and hazard tree removal, although recent wildfires and continued MPB mortality would increase snags and future downed wood. While there would be localized areas where dead wood is lacking, snag density will remain high within all watersheds and dead wood would continue to be available.

Irreversible or Irretrievable Commitments

There are no irreversible commitments anticipated, although irretrievable commitments include a reduction in large-diameter snags.

Alternative 1 Determination

Due to continued fire suppression, snags and DWD would continue to be abundant. While the component of large diameter snags would be reduced in the future under this alternative, dead wood habitat would continue to be widely available across the landscape and adequate habitat would exist to meet the needs of species that prefer or require this component. Due to increased risk of large-scale wildfire, it is likely that habitat would be provided for species that utilize dead wood associated with post-fire habitat.

Alternatives 2 and 3

Both alternatives propose a mix of treatments that would have varying effects on snags and DWD. Table 94) displays the different treatments, the amount proposed under each alternative and general effect on dead wood.

Table 94. Snag and DWD effect and treatment summary

Treatment	Effects	Alternative 2		Alternative 3	
		Acres	%	Acres	%
Regeneration Harvest	Long-term reduction in snags and DWD. Retention of large diameter snags >20 inches, as well as a component of small diameter snags and snag recruitment trees. Some DWD including component of large diameter logs retained.	968	4	816	3
Intermediate Treatments	Reduction in snags and DWD. Retention of large diameter snags >20 inches, as well as a component of small diameter snags and snag recruitment trees. Some DWD including component of large diameter logs retained.	2,131	9	1,482	6
Low Severity Fire	Large and medium diameter snags retained and an increasing number of small diameter snags available. Reduction in small diameter DWD across the area treated, although some DWD including large diameter logs would be retained. Distribution would be patchy or clustered (Agee 2002). Twenty percent of the site would be unaffected.	449	2	964	4

Treatment	Effects	Alternative 2		Alternative 3	
		Acres	%	Acres	%
Mixed Severity Fire	Increase in small and large diameter snags. Some DWD including large diameter logs retained. DWD patchy in areas with low severity fire, whereas more intense burning would have decreased DWD and increased snags in all size classes. Net increase or pulse of DWD likely (Agee 2002). Twenty percent of the site would be unaffected.	5,014	21	3,301	14
Unaffected Habitat	Standing and down wood available in the short and long-term, although possible long-term reduction in large diameter snags on sites containing ponderosa pine.	15,106	64	17,106	72

Alternative 2

Direct and Indirect Effects

Under alternative 2 approximately 64 percent of the project area would not be treated, and effects would be the same as that described under alternative 1. Approximately 36 percent of the project area would be affected by treatment and there would be a reduction in DWD on most of this acreage. Project design features acknowledge the importance of snags in individual units and while precise retention is not guaranteed, the following would contribute to maintaining habitat for snag dependent species:

- Some small-diameter snags would be left due to merchantability.
- All whitebark pine snags would be retained where available unless they pose a specific safety or operability concern.
- In all regeneration harvest units, retain all snags 20 inches d.b.h.unless they pose a safety concern, and a minimum of two snags 12 to 20 inches d.b.h. per acre. If snags are not available, retain recruitment trees. Preferred species for retention include larch, ponderosa pine, Douglas-fir, spruce and sub-alpine fir, in that order. There would also be a few reserve tree/patches and inoperable areas to provide replacement trees (5 to 150 trees per acre).
- In intermediate harvest units, retain all snags greater than 20 inches d.b.h. unless they pose a safety concern, and a minimum of two snags 12 to 20 inches d.b.h. per acre. If snags are not available, retain recruitment trees of preferred species. There would also be abundant live trees in various size classes retained for snag replacement (75-300 trees per acre).
- In burn units, do not cut any snags greater than 12 inches d.b.h. unless they pose a safety or operability concern.

It is assumed that intermediate and regeneration harvest treatments would reduce snags to two snags per acre, whereas modeling of prescribed burning would increase snags by about 74 to 76 snags per acre in the moderate-severity burn areas. Assuming that snag availability within the rest of the project area was unchanged, it is estimated that post-treatment, snag numbers would decrease to about 42 snags per acre within drainage 0203, 47 snags per acre in drainage 0204, and increase to 48 snags per acre across the project area as a whole (USDA Forest Service 2012c). It is recognized that snags per acre would vary across the project area and a range of conditions would exist, with some snags occurring in clumps and others distributed individually. As occurs naturally, some areas would have few snags. Habitat would continue to be available to support species dependent on dead wood because of the widespread availability of snags in all size and decay classes within all project area drainages, retention of snags within treatment units, and recruitment of new snags due to ongoing MPB mortality, as well as high snag density within untreated stands.

Alternative 3

Direct and Indirect Effects

Effects would be similar to those of alternative 2, except that 72 percent of the project area would not be treated and effects on this acreage would be similar to that of alternative 1. Approximately 28 percent of the project area would have a reduction in DWD. Snag numbers for alternative 3 would be slightly different from alternative 2, but given the magnitude of the recent mortality and the large number of snags within the analysis area, the difference would be slight. Using the same assumptions described under alternative 2, average snag numbers would decrease to 41 snags per acre in drainage 0203, increase to 47 snags per acre in drainage 0204A and increase to 48 snags per acre in the project area (USDA Forest Service 2012c). Like alternative 2, habitat would continue to be available to support species dependent on dead wood because of the widespread availability of snags in all size and decay classes within all project area drainages, retention of snags within treatment units, and recruitment of new snags due to ongoing MPB mortality.

Effects Common to the Action Alternatives

The action alternatives would meet or exceed Forest Plan standards related to snags by retaining snags greater than 20 inches d.b.h.(unless they pose a safety hazard) and implementation of pdfs (WL-5, 6, 7, 8); snag-replacement trees would be retained and untreated patches of snags would continue to be provided. While snags would be reduced on the lands affected, all treatment sites would continue to provide habitat for snag dependent species. Similarly, while dead wood habitat would be reduced, with implementation of pdf WL-9, between 5 and 20 tons per acre of dead wood would be retained, including a component of large-diameter logs. Treatments proposed under both alternatives would increase the ponderosa pine component, therefore, future recruitment of large-diameter snags and large, downed wood would increase under both alternatives, when compared to no action.

The distribution of snags also affects wildlife. For example, within treatment units snags retained would be more evenly distributed and would likely favor secondary cavity nesters, whereas a more patchy distribution of concentrated snag mortality associated with mixed-severity fire would likely favor primary cavity nesters (Bunnell et al. 2002). The mix of treatments proposed combined with the large area that would not be treated would provide an adequate distribution of snags to meet the needs of both primary and secondary cavity nesting species.

In summary, both alternatives would result in a reduction in snags and DWD reducing habitat for snag-dependent species and species that prefer or require down wood. With implementation of pdfs, forest plan standards related to snags would be met and all sites would provide between 5 and 20 tons per acre of downed wood. All treatment sites would continue to provide habitat for wildlife dependent on standing and downed wood. As a result and considering; (1) 20 percent of all prescribed burning units would be left untreated, (2) over 64 percent of the project area would be unaffected, (3) treatment would promote ponderosa pine and recruitment of future large diameter snags, and (4) snags and down wood would continue to be available across the landscape and within affected watersheds; habitat for wildlife species that prefer or require dead wood would continue to be available.

Cumulative Effects

Like alternative 1, anticipated cumulative effects include a continued reduction in snags and DWD due hazard tree removal, firewood collection and past wildfire. Additionally, proposed timber harvest would reduce snags and downed woody debris on (alternative 2) approximately 3,100 acres whereas burning would reduce down wood on up to 5,463 acres. Snags and DWD would be retained on all units and prescribed burning would be expected to result in an increase in snags and recruitment of downed wood. As a result and considering the elevated levels of snags and DWD across the landscape, dead wood habitat would continue to be available.

Irreversible or Irretrievable Commitments

There are no irreversible commitments anticipated. While the action alternatives would reduce snags and DWD on the acreage treated, standing and downed woody debris would continue to be available, and there are no irretrievable or irreversible commitments to wildlife species dependent on dead wood under either alternative. Like alternative 1, there would continue to be a reduction in large-diameter snags on sites containing ponderosa pine that are not proposed for treatment.

Alternative 2 and 3 Conclusions

Alternatives 2 and 3 would affect dead-wood habitat on 36 and 28 percent of the project area, respectively. Based on the above analysis and the following rationale, both alternatives would maintain habitat for wildlife species dependent on dead wood.

- ♦ Due to MPB mortality, levels of standing and downed woody debris greatly exceed historical levels. Because over 64 percent of the project area habitat would not be treated, snags and DWD would continue to be available across the landscape.
- ♦ Forest Plan standards related to snags would be met in all sites proposed for treatment.
- ♦ Proposed treatments would promote development of future large-diameter snags.
- ♦ Snags and downed woody debris would continue to be available to meet the needs of wildlife species dependent on dead wood.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The following Forest Plan direction is related to snags (USDA Forest Service 1986 p. II-21-22)

- ♦ To keep an adequate snag resource through the planning horizon, snags should be managed at 70 percent of optimum (snags/acre) within each third order drainage – With implementation of pdfs, all sites would provide a minimum of 2 snags per acre, whereas all watersheds would continue to provide an average of over 40 snags per acre. As a result all alternatives are consistent with Forest Plan direction.
- ♦ *Large, ponderosa pine, Douglas*-fir, *spruce and subalpine fir,* in that priority, are the preferred species for snags and replacement trees – With implementation of pdfs that identify this order of priority for snag retention, all alternatives are consistent with this direction.
- ♦ *Management areas other than T-1 should be the primary source for snag management. However if adequate snags cannot be found outside of T-1, then sizes and snags should be retained at rates designated on page II-21 of the Forest Plan* – Project design features require that snags be retained at designated levels and all alternatives are consistent with this direction.

Landscape Diversity, Connectivity and Fragmentation

This section describes alternative effects to landscape diversity, connectivity and fragmentation, although connectivity and fragmentation are also discussed under species-specific sections.

While many species prefer specific forest communities, wildlife use of an area is often determined by the diversity of habitat conditions that exist across the landscape (Reynolds et al. 1992; Wright 1992). This section summarizes alternative changes in the size and age-class diversity of forested habitat, which is summarized in table 95. Non-forest habitat, which makes up approximately 4 percent of the project area, is not displayed as it is essentially the same under all alternatives. Existing landscape diversity is discussed in the Project Area Description section.

Table 95. Forested size and age class diversity by alternative

Size Class	Alternative 1		Alternative 2		Alternative 3	
	acres[1]	%[2]	Acres[1]	%[2]	Acres[1]	%[2]
<1 inch d.b.h. (seedling)	0	0	968	4	816	3
1-4 inches d.b.h. (sapling/pole)	3,845	17	3,747	16	3,776	16
5-9.9 inches d.b.h. (small diameter mature)	10,743	47	10,049	42	10,142	42
10-14.9 inches d.b.h. (medium diameter mature)	8,103	35	7,909	33	7,938	33
>= 15 inches d.b.h. (large diameter mature)	333	1.4	333	1.4	333	1.4

[1] Acres within the project area.
[2] Percent of project area.

Alternative 1

Direct and Indirect Effects

Diversity, Connectivity and Fragmentation

Landscape diversity would remain largely unchanged under this alternative. As a result, small and medium-sized mature forest would continue to predominate on 82 percent of the project area, whereas seedling forest would continue to be largely absent. The Stonewall Project area would continue to be characterized by a predominance of mature forest habitat. While some seedling habitat would continue to occur in areas with concentrated MPB mortality and recent wildfire, there would be little change in horizontal or landscape-level diversity, reducing habitat for species that prefer a diversity of age and structural conditions. Due to conifer encroachment, the availability of mountain meadow and shrub habitat would continue to decline.

As described under affected environment, closed canopy forest within the project area has been reduced from approximately 80 percent of 19 percent due to past and on-going MPB mortality. These changes have already altered travel patterns for species such as fisher that prefer or utilize dense overhead cover. While the standing dead trees would continue to provide cover for a few years, within five to 10 years areas, areas of concentrated mortality would no longer provide screening and large amounts of down wood would act as barriers for some species. As a result these changes would continue to alter movement patterns in the future. The availability of dispersal, migration, and travel corridors depends on the species of interest and their requirements for movement. Also over time, the availability of wildlife corridors would fluctuate somewhat with forest succession and, potentially, wildfire. While travel and migration corridors would continue to be available, these corridors would change spatially and temporally.

Fragmentation would change somewhat under this alternative as the successional stages result in a shift in the spatial arrangement of edges and ecotones over time. Most species would be able to adjust to these changes, although large-scale wildfire would result in landscape-level fragmentation.

Cumulative Effects

Cumulative effects are evaluated across the combined boundary and past, ongoing and anticipated future cumulative effects are discussed in volume 2, appendix C. Long-term changes in the landscape and effects on wildlife dispersal and travel are most affected by activities that alter the overstory or isolate forest patches. Past activities that have fragmented mature forest have included road construction, private land development and regeneration harvest on all ownerships and wildfire. Most off-forest harvest occurred at lower elevations within portions of the analysis area that had already been fragmented due to human development or adjacent to lands dominated by nonforest. Approximately, 8,000 acres of regeneration harvest have occurred since the late 1950s. While most of these stands are now characterized by predominantly closed canopy conditions, young forest still predominates on approximately 2,200 acres, and these sites would continue to reduce habitat and modify movement for many mature forest obligates. While past intermediate harvest, (on 2,300 acres) affected movement following treatment, understory conditions and cover as well as movement by wildlife has been largely restored. Similarly, understory conditions and wildlife movement would have been largely restored in most area affected by past fuel treatments. Recent wildfire (2003 to 2009) has affected 23,418 acres, which has greatly reduced seasonal movements and altered migration and dispersal of forest obligate species within much of the Copper Creek and Lincoln Gulch drainages. Finally, past and ongoing mountain pine beetle mortality has killed most of the mature lodgepole pine, which has altered dispersal, migration and travel corridors.

While some new development of private lands may occur in the future, this is expected to be localized and to occur largely in areas that are already developed. No new road work is proposed, although the existing road system would continue to impact wildlife species that are affected by the road itself or associated edge effects. Ongoing hazard tree removal will affect approximately 570 acres of roadside habitat by removing dead and dying trees on approximately 100 feet on either side of the road. Additionally, recent wildfire has reduced mature forest on another 450 acres. While the future and recent loss of cover from hazard tree removal and wildfire may cause some species to alter movement patterns, because the canopy is already dead and considering lands affected by recent wildfire (since 2011) are interspersed with intact mature forest, it is not anticipated that the seasonal migration, dispersal or daily movement for any species would be significantly altered.

Implementation of alternative 1 would contribute to the effects associated with past timber harvest, fuel treatments and wildfire. Ongoing and future MPB mortality would continue to reduce mature forest and create seral forest conditions. These areas would continue to be avoided by forest obligates. Road use that is the result of past actions would continue to impact wildlife that avoid roads. Cumulatively, past ongoing and future effects have reduced closed canopy conditions and altered wildlife movement. However, with the exception of the Copper Creek and Lincoln Gulch watersheds, connectivity within the analysis area would remain relatively unchanged and unaffected forest would continue to be available to accommodate seasonal movement and travel corridors within and adjacent to the analysis area.

Irreversible or Irretrievable Commitments

Early seral habitat would continue to decline, although due to increased risk of wildfire, it is likely that this component would increase in the future and there would be no landscape-level irreversible or irretrievable commitments under this alternative.

Alternative 1 Conclusions

While MPB mortality would continue to reduce closed canopy forest conditions, there would be little change in landscape-level habitat or age class diversity, and the analysis area would continue to provide habitat preferred by species that favor mature forest conditions. While some earl seral habitat would be provided in areas of concentrated MPB mortality, habitat for species that prefer or require higher levels of horizontal and vertical diversity across the landscape would remain low.

Hazard tree removal and continued MPB mortality would reduce connectivity and alter the seasonal and daily movement and dispersal of wildlife. However, unaffected lands would continue to be available to serve as alternate movement corridors and existing connectivity would be largely maintained.

Action Alternatives

Direct and Indirect Effects

Diversity

Like alternative 1, late-successional habitat (greater than 15 inches d.b.h.) would remain largely unchanged. While alternative 2 would result in more seedling (18 percent) habitat, both alternatives would increase early seral habitat by 3 to 4 percent and result in a corresponding decrease in mature forest habitat. Landscape-level diversity would increase, mature forest conditions would be maintained on over 75 percent of the project area, and habitat for species that prefer landscapes dominated by mature forest would continue to predominate. As described previously, both action alternatives would move vegetation structure closer to historical or reference conditions.

Connectivity

Under the action alternatives, timber harvest and prescribed burning would occur within existing dispersal, migration and travel corridors. Intermediate harvest would result in a reduction in canopy cover and tree density that may render these areas unsuitable as corridors for mature forest obligates. Treatment could also affect movement corridors between summer and winter range or alter the way in which big game and other wildlife use these seasonal corridors. Because understory vegetation, including the amount and diversity of forage, would increase on these sites, treatment would allow animals to forage as they move through the area, modifying seasonal use.

Regeneration harvest treatments are proposed mainly in stands with concentrated mortality. These stands have already lost their suitability as a corridor for species associated with more closed canopy conditions. For some species, the removal of standing dead trees would further reduce hiding cover or screening that otherwise could allow safe passage throughout the area.

Low-severity and most of proposed mixed-severity burning would have little impact on dispersal, migration and travel patterns of wildlife. While there may be some displacement during prescribed burning activities until the understory is re-established, because all units would have a mosaic of burned and unburned land, impacts would be reduced. Larger openings created by mixed severity burning could result in long-term changes in movement or dispersal for species such as wolverine, which are reluctant to cross burned areas (Hornocker and Hash 1981). Conversely, species including deer and elk would be attracted to these areas because they provide elevated levels of forage adjacent to cover (USDA Forest Service 2006b). Finally while burning would alter movement and dispersal for wildlife that use the project area, considering that many western conifer forests were historically affected by frequent, low- to mixed-severity burning, native species are adapted to historical fire regimes and resulting habitats (Saab and Powell 2005), and that multi-story fires typically leave a patchy erratic pattern of mortality on the landscape that fosters development of highly diverse ecosystems (Arno 2000), it is expected that landscape level dispersal, movement and migration following proposed fire would be maintained in the short term and long term.

Alternative 2 proposes approximately 20 percent more regeneration harvest, would create approximately 25 percent more fire-created openings, and would result in approximately 45 percent more open-canopy habitat due to partial harvest. As a result, effects to closed-canopy forest and changes to wildlife movement and are higher under this alternative.

Fragmentation

Approximately 64 percent of the project area under alternative 2 and 73 percent under alternative 3 would be unaffected by treatment and like alternative 1, fragmentation of these lands would occur largely through natural disturbances and succession. In the absence of large-scale wildfire, mid- to late-seral forested conditions would be unchanged.

Under alternatives 2 and 3 approximately 36 percent and 27 percent of the project area would be affected by treatment respectively. Timber harvest, construction of project roads built then obliterated, and mixed-severity burning would increase mature forest fragmentation and edge, with alternative 2 resulting in the greatest increase. Effects include a reduction in interior habitat and an increased likelihood of predation or brood parasitism.

Effects of fragmentation are well-documented, but vary across regions (Chalfoun et al. 2002, Cavitt and Martin 1993, Young and Hutto 1999) . For example, while fragmentation and associated predation and brood parasitism by the brown-headed cowbird (*Molothrus ater*) are well-documented effects in the east, effects in the west are more variable and fragmentation west of the Rockies does not always result in significant increases (Cavitt and Martin 1993). Effects also vary based on the landscape condition and local predator populations (Cavit and Martin 1993, Young and Hutto 1999, Hutto et al. 1993). Hutto and Young (1999) studied the habitat and landscape factors influencing the distribution of cowbirds. They found cowbirds were largely absent from old growth and high-elevation forest and were most abundant in ponderosa pine and partially logged sites, as well as grassland and riparian cover types. While distance from agricultural areas was a factor when detected in conifer forest, cowbirds were much more likely to be near open grassland and agriculture. The presence of host species was also found to be a factor (Tewksbury et al. 1998). In their evaluation, Hejl et al. (1995) found that only three of 19 studies had cowbirds, and there was no indication that they were more likely to occur in clearcut than uncut forests. Also it appears the presence of clearcuts does not draw cowbirds into forested areas (Young and Hutto 1999, Hejl et al. 1995).

Because the project area is predominantly forested, effects such as brood parasitism would be reduced from those that occur in more fragmented landscapes. This is consistent with data from the project area landbird transects, in that cowbirds were not documented on all transects, and that when they were documented, they occurred in low numbers closer to private land (i.e., agricultural and grassland). Because cowbirds are present, an increase in nest parasitism would likely occur in some sites proposed for regeneration and partial harvest. Because the project area is predominantly forested and considering that harvest would not be expected to draw cowbirds into forested lands (Young and Hutto 1999, Hejl et al. 1995), sites away from private land are less likely to be affected. Similarly, because they occur within the project interior, the likelihood that fire-created openings would result in increased parasitism is low.

Fragmentation resulting from treatment would also be expected to result in changes in predation, although this is also affected by landscape condition and the local predator populations. For example Tewksbury et al. (1998) demonstrated that nest predation was higher on sites that were not fragmented, when compared to sites fragmented by agriculture and human development in the Bitterroot Valley of Montana. They suggested that this was due to more abundant nest predators such as the red squirrel (*Tamiasciurus hudsonicus*) in forested landscapes. Predation effects are also more prevalent when fragmentation occurred at the landscape-scale, rather than at the patch- or edge-scales (Stevens et al. 2003, Chalfoun et al. 2002), suggesting that nest predation is driven more by the diversity of nest predators present. Also local edge-related effects were more common within agricultural landscapes (Chalfoun et al. 2002).

Structural changes resulting from proposed treatments would increase fragmentation of mature forest, increase the diversity of seral stages and result in changes to local predators. Stands proposed for timber harvest are concentrated in stands that have already been affected by MPB mortality, reducing changes to the live overstory. Also between 87 percent (alternative 2) and 92 percent (alternative 3) would be unaffected by harvest, whereas proposed burning would be characteristic of historic disturbance regimes.

While there may be changes in predation at the local scale, there are no changes anticipated that would result in long-term effects from predation.

Summary

Both alternatives would result in landscape-level changes that affect wildlife movement and use, with alternative 3 resulting in fewer changes. In the short term, wildlife would have to alter movements to adjust to changes. Adjacent unaffected habitat is available to accommodate changes in movement use, and anticipated shifts would be no greater than what animals would adjust to after small to moderate natural disturbances.

Habitat would be reduced for species that prefer closed-canopy mature forest, whereas habitat would increase for early seral species, and species that utilize multiple seral stages. Mature forest fragmentation and fragmentation-related effects would increase, mid- to late-seral habitat would continue to predominate across the project area, and changes in the landscape would approach conditions that occurred historically. As a result and considering that western populations of wildlife are adapted to naturally fragmented forested landscapes (Dobkin 1994, Hutto 1995, Saab and Powell 2005), it is expected that wildlife habitat diversity, dispersal and movement would be maintained.

Cumulative Effects

In addition to cumulative effects described under alternative 1, proposed activities would open up forest understories and reduce screening on up to 5,313 acres (intermediate harvest and low severity burning), and reduce mature forest habitat and connectivity on up to 2,227 acres (road construction, regeneration harvest, high severity fire) under alternative 2. Habitat for mature forest species would be reduced and movement and dispersal of wildlife on these lands would be altered.

Because lands affected by treatment are interspersed with unaffected lands and considering treatment would occur over a 10-year period, alternate travel routes would exist to accommodate changes in movement or travel. Conditions resulting from treatment would be similar to what occurred historically and native species have adapted to habitats created by low- and mixed-severity fire (Saab and Powell 2005). While use of the analysis area would change following treatment, the resulting mix of habitats would continue to accommodate wildlife use both in the short and long term.

Irreversible or Irretrievable Commitments

There are no irreversible commitments under either alternative. However, both alternatives would result in an irretrievable commitment in the form of proposed project roads to be built then obliterated immediately following timber removal.

Action Alternatives Conclusions

Timber harvest and prescribed burning would open up patches of forest habitat and occasionally disrupt movement patterns across the landscape for some forest obligates. Treatments would not preclude travel through most sites, but would affect movement to some degree. Areas of untreated forest would remain interspersed with treated stands, providing a variety of alternate travel routes.

Due to changes in the understory, proposed actions would increase sight distances and allow animals moving through the area to be seen from further away. The open stands created by partial harvest and most of the burning would continue to screen large animals such as elk, deer, moose, and black bear, but at reduced levels. Conversely, the forage value of the treated areas would be higher, allowing animals more opportunity to feed as they moved through the area. The proximity of forage to cover and potential effects are discussed in more detail in section 4.6 and under the species-specific sections.

Due to proposed regeneration harvest and avoidance of late-successional habitat/future old growth, landscape-level age and structural diversity would increase and habitat would be improved for species that prefer landscapes containing greater horizontal and vertical diversity. Like alternative 1, habitat for species that prefer mature forest conditions would continue to predominate.

In the short term, some wildlife would have to adjust their movement patterns to take advantage of untreated areas. Given that harvest and prescribed burn patterns would mimic historic patterns, it is expected that landscape level dispersal, movement and migration would be maintained.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

There are no specific Forest Plan standards applicable to management of dispersal, migration, and/or travel corridors. Because habitat connectivity would be maintained, all alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Threatened and Endangered Species

This section describes alternative effects on threatened and endangered species evaluated in detail (See the Habitat and Species Evaluated section).

Canada Lynx

The analysis of effects to lynx and their habitat concentrate on whether the proposed activities maintain critical habitat and promote the long-term sustainability of lynx. To this end, the effects to lynx by are evaluated with respect to their compliance with the objectives, standards and guidelines identified in the Northern Rockies Lynx Management Direction (NRLMD) (USDA Forest Service 2007a) and the Biological Opinion (BO) (USDI Fish and Wildlife Service 2007b). Impacts to lynx critical habitat are evaluated with respect to the Primary Constituent Elements identified by the USFWS (USDI Fish and Wildlife Service 2014; USDI Fish and Wildlife Service 2009a).

Alternative 1

Direct and Indirect Effects

No treatments are proposed for the no-action alternative, so there would be no direct or indirect effects on lynx from project activities. However, even in the absence of management actions, lynx habitat conditions in LAUs BL-07 and BL-08 will continue to undergo change. It is almost certain that the availability and distribution of winter snowshoe hare habitat for lynx foraging will change over the next few decades, but the exact trajectory of this change is difficult to predict.

Due to past fire suppression, the departure from historical conditions and increased fuel loading the risk of wildfire in this area has increased (Buhl 2015). Generally, spruce/fir types, which provide preferred lynx habitat have been less affected by fire suppression due to longer fire return intervals. Whereas lower-elevation mixed-conifer stands, which also provide some lynx habitat, are interspersed with dryer communities, and have shorter fire return intervals.

Currently, 37 percent of mapped lynx habitat within LAU BL-08 is in an early stand initiation stage. This is almost entirely due to the 34,000-acre Snow-Talon wildfire that burned a considerable portion of that area in 2003. While these lands are in a stand initiation stage that currently provides winter foraging habitat, continued stand development over the next several years will increase the availability of winter foraging habitat throughout much of the burn area.

Generally, winter hare habitat in these areas develops approximately 10-30 years after a stand-replacing event such as fire (USDI FWS 2007b). Presently there are lands within the burned portion of the LAU, particularly the moister lower-elevation sites that support sufficient height (10-15 ft.) and stem densities of lodgepole pine regeneration to provide winter hare forage and cover. Other portions of the burn area that supported late-seral species such as subalpine fir, experienced higher burn intensities or support less favorable site conditions for regeneration, and are not expected to provide high quality winter hare habitat for at least 20 years post-disturbance. Some other portions of the burn area have naturally low site potential and are not anticipated to develop into high quality winter hare habitat. To that extent, the variability in regeneration will serve to provide a more mosaic pattern of suitable hare habitat throughout the burn area over time. Since the lynx habitat model used for structural classification of lynx habitat defines stand initiation winter hare habitat as a minimum of 15 years of age, all lynx habitat within BL-08 that burned in 2003 is treated as currently not winter hare habitat.

Many of the current stem exclusion and mid-seral timber stands (stands that do not currently provide winter foraging habitat) have been affected by MPB mortality and have opened up (lost canopy cover), putting them at an increased risk for wildfire. Stand-replacing fires in these areas could provide high quality snowshoe hare forging habitat after approximately 10 to 30 years (USDI Fish and Wildlife Service 2007b). In the absence of stand-replacing fire or other disturbance, some of these stands will remain stagnant for many years providing poor quality hare and lynx habitat. With sufficient overstory mortality to promote understory development, portions of some stands may gradually develop multi-storied habitat characteristics, which also provides snowshoe hare foraging habitat, over time. However, the increased risk of fire could also negatively affect existing multi-storied stands that are currently providing snowshoe hare habitat, removing their suitability for lynx for many years.

Cumulative Effects

The cumulative effects analysis area for lynx in the Stonewall Project under all alternatives is the combined area of both LAUs (BL-07 and BL-08), which totals 54, 211 acres. Projects occurring (or planned) within this area are considered in this analysis with regard to how they contribute cumulatively with the Stonewall Project to affect lynx and lynx habitat. Projects outside this cumulative effect analysis area are not considered.

This area was chosen because:

1. It is large enough to assess habitat conditions over an area much larger than the home range of a breeding female lynx
2. The area contains a good distribution of lynx habitat components and can be used to adequately assess effects to lynx movement and landscapte connectivity.
3. It includes all lynx critical habitat potentially affected by project activities
4. Attempting to expand the boundary to the north would incorporate wilderness, which would potentially dilute project effects.
5. Expanding the boundary to the south would include private land that is highly fragmented and doesn’t provide preferred lynx habitat conditions.
6. It is inclusive of landscape linkages used by lynx (USDA Forest Service 2007g)

There are a number of past and ongoing activities occurring within the analysis area that have affected lynx habitat; a extensive list of activities considered can be found in volume 2, appendix C. While some of these past activities have negatively affected lynx by reducing winter foraging and den habitat, others have had positive effects because they improved understory structure and the amount and distribution of snowshoe hare habitat. Lynx habitat conditions are dybnamic, and effects vary over time. For example, while past regeneration harvest treatments reduced multi-story or mid-seral habitat initially, many of these sites now provide useful stand initiation habitat. Similarly, while past partial harvest treatments such as thinnings and improvement cuts reduce forage and cover immediately following harvest, there has been very little thinning in the last 20 years and many of these sites are now provide winter foraging and denning. Much of the recent management (since 2000) in BL-08 has been related to salvage and reforestation activities (i.e., tree planting) associated with the Snow Talon fire. These treatments were designed to promote the development of tree regeneration following the fire, and promote increased stand diversity. While much of the land affected by the 2003 Snow Talon fire does not yet provide winter foraging habitat, due to the height of the existing cover, it is expected that winter hare habitat will increase substantially in this area in the next several years and beyond.

In addition to past activities that influence the existing lynx habitat conditions in this area, there are some ongoing and proposed Forest Service activities within the combined project LAUs, including; winter recreation, existing campground and outfitter guide use, prescribed burning, new trail construction, campground maintenance, stream improvement work, livestock grazing, nonnative invasive plant treatments, road and trail maintenance, hazard tree removal, potential wildfire suppression or rehabilitation activities and, implementation of the Blackfoot Travel Plans (winter and non-winter). To some extent all of these activities have the potential to cumulatively affect lynx or lynx habitat..Within the analysis area the following actions with the potential to cumulatively affect lynx and lynx habitat are expected to occur within the next decade, with various actions continuing further into the future. Activities that have the greatest potential to cumulatively impact lynx are primarily those with the potential for long-term displacement of lynx due to habitat loss or degradation..

- Ongoing summer campground use and maintenance
- Continued livestock grazing on National Forest System land and lands of other ownership.
- Off-road invasive plants treatment – will continue to change as treatment needs are identified.
- Road and trail maintenance, including NNIS treatments, hazard tree removal and wildfire-related work.
- Stream restoration, including culvert replacement and bridge installation on Klondike and Yukon creeks anticipated to be completed in 2015.
- Stonewall Creek stream restoration project with anticipated implementation in 2015 and 2016.
- Road decommissioning, motorized and non-motorized trail construction during implementation of the decision for the Blackfoot Non-Winter Travel Plan anticipated in late 2015.
- Continued implementation of 2013 Blackfoot Winter and pending Non-winter Travel Plans – project-specific travel plan analysis and consultation addresses wildlife issues related to motorized and non-motorized use throughout the analysis area.
- Past and future timber harvest on lands of other ownerships.
- Continued public firewood collection.

In general, most of these ongoing activities will not adversely affect lynx habitat. For example, lynx habitat would be largely unchanged due to campground maintenance or improvements, road and trail maintenance, culvert replacement and invasive plants treatments. Considering that lynx are generally tolerant of human activities (Ruediger et al. 2000), effects to lynx would occur largely in the form of short-term avoidance of project sites during treatment. Hazard tree removal and firewood collection would reduce snags and future downed woody debris along roads, although these sites do not provide preferred denning habitat (Ruediger et al. 2000; Koehler and Brittell 1990) and understory vegetation and winter foraging habitat would be largely unchanged. While grazing use is not expected to change, approximately 5,900 acres of mapped habitat will be affected by grazing and understory vegetation will continue to be influenced. While there is no evidence that grazing is a factor threatening lynx (USDI Fish and Wildlife Service 2007b), monitoring and grazing management strategies associated with existing allotment management plans and adherence to allowable use standards are expected to reduce impacts to lynx. The analysis for the Blackfoot Winter Travel Plan (final ROD 2013) and pending Blackfoot Non-Winter Travel Plan (final ROD anticipated in 2015) addressed wildlife issues, including potential impacts of motorized use to lynx. Generally, lynx do not appear to avoid forest roads or groomed snowmobile routes (Squires et al. 2010) and cumulatively there are no long-term adverse impacts to lynx from existing roads or winter recreation anticipated.

As Forest Service projects, these and other future activities are assessed for impacts to lynx and lynx habitat, and submitted for consultation with the USDI Fish and Wildlife Service, as appropriate. It is expected that future project decisions will be consistent with the Northern Rockies Lynx Management Decision (NRLMD).

The lynx cumulative effects analysis area contains 675 acres of private lands. Activities on these lands are considered in the cumulative effects analysis but are outside of Forest Service control.

While timber harvest on lands of other ownership is expected to continue into the future, generally these lands occur at lower elevations or as scattered parcels in fragmented portions of the analysis area. As a result these areas provide less lynx habitat, and it is not expected that future activities on lands of other ownerships would further reduce suitable lynx habitat or create barriers to lynx movement.

Most climate forecasting models generally predict a warmer and drier climate in the Northern Rocky Mountains indicating that climate change may be an issue of concern for the future conservation of lynx (Gonzalez et al. 2007). With a warming climate, fire seasons in the western United States are likely to be extended, resulting in a potential increase in the amount of and size of higher-severity fires (McKenzie et al. 2004). As stated previously, fires have the ability to reduce, then after sufficient time for regrowth, improve lynx foraging conditions. Reduced snow depth, condition, and persistence may diminish the competitive advantage of lynx relative to bobcats and coyotes.

In summary, there may be localized changes in lynx habitat from ongoing and future activities. However, in the absence of large natural disturbance events, the expected availability of lynx denning and winter foraging habitat would be largely unchanged in the foreseeable future, and there are no long-term adverse effects to lynx or lynx habitat anticipated under alternative 1.

Irreversible or Irretrievable Commitments

There are no irreversible or irretrievable commitments to lynx or lynx habitat under this alternative.

Determination and Conclusions

While the risk of wildfire remains high, there are no direct project effects associated with alternative 1. The objectives, standards and guidelines of the NRLMD apply when management actions on National Forest System lands are designed or implemented, but they do not compel any management activity to correct or improve a less than desirable existing situation. Alternative 1 is in compliance with the NRLMD and terms and conditions of the USDI Fish and Wildlife Service Biological Opinion. As a result, the determination for continued implementation of alternative 1 is **may affect, not likely to adversely affect** Canada lynx and its habitat.

Action Alternatives

Direct Effects

Scientific literature is limited regarding the effects of human activities and associated disturbance factors that might affect lynx. To date there is little evidence that lynx are particularly sensitive to human disturbance other than near reproductive den sites (Ruediger et al. 2000; Koehler and Brittell 1990) and some authors have described lynx as being generally tolerant of human activities (Ruediger et al. 2000).

Potential effects to den sites are largely affected by the likelihood that activities would occur during the denning period and research in Montana indicates that lynx mate in late winter and females localize at natal dens in mid-May. Also Squires et al. (2006) found that dens were usually located in mature mesic forests on northeast aspects and that during late May and June, lynx may move kittens from the natal den to a series of maternal dens. It is anticipated that proposed burning would occur largely in the fall outside the denning period. Harvest would occur in either frozen winter conditions or during the drier summer period outside the spring denning period. Most if not all of the spring denning period occurs during spring break-up, or when wet conditions would restrict timber harvest. Less than 4 percent of the proposed harvest aces (300 acres) occur on preferred north facing slopes.

Collectively for these reasons, as well as the widespread availability of unaffected denning habitat, the likelihood that an active den would be affected by treatment is reduced.

NRLMD Guideline Veg G11 addresses lynx denning habitat and discusses how this habitat should be distributed across the landscape within LAU’s. Research suggests that denning habitat is generally not limiting (USDA Forest Service 2007b p. 15), especially when a substantial portion of the landscape is under Federal ownership. Because 98 percent or more of project area LAUs are under Forest Service Ownership and because there are large blocks of mature forest with significant amounts of coarse woody debris, denning habitat is not considered to be limiting on the landscape or within the project area.

Approximately 15 and 12 percent of the mapped lynx habitat would be affected under alternatives 2 and 3 respectively. Project activities occurring in May or June would have the greatest potential for disturbance or displacement from maternal dens. Proposed treatments would occur over a 10-year period and are interspersed with unaffected lands; therefore, suitable lynx habitat will still be available to accommodate any animals temporarily displaced by treatment under either action alternative.

Effects of Treatment Activities on Lynx Habitat

Treatments proposed under both action alternatives emphasize fuel reduction and reducing wildfire risk, while reintroducing fire and improving vegetative species diversity. This section contains a generalized discussion of the individual treatments proposed under the two action alternatives and their effects to lynx habitat conditions.

Individual treatments with similar effects on vegetation structure have been grouped together for analysis purposes. They include regeneration harvest (clearcutting, and shelterwood/seedtree harvest); intermediate harvest (improvement cutting of mature stands, sanitation salvage, precommercial thinning of young stands); and prescribed burning (low- and mixed- severity fire, underburning and jackpot burning). Burning treatments include lands where only burning would be conducted, as well as lands that would receive both harvest and burn treatments.

All discussion regarding the effects of treatments on lynx habitat conditions incorporates implementation of specific project design features (e.g., WL-26, WL-27, and WL-28) as identified in (table 9) for particular treatment units (also identified in table 9), as well as the assumption that within harvest units both action alternatives would retain downed wood, large-diameter logs and understory inclusions of shrubs in unburned areas. The following summarizes conditions related to these pdfs which are designed to reduce impacts to lynx habitat:

- **PDF WL-26 –** This design feature provides for minimal brush cutting along low-speed roads. This design feature provides for public safety while minimizing the loss of roadside cover.
- **PDF WL-27 -** While some of the proposed burn units located outside the Tri-County WUI contain pockets of multi-story habitat, this situation largely occurs along the unit perimeters and these areas of multi-storied habitat would be avoided during project layout and implementation. Also, there are a few patches of MS habitat that occur as small inclusions within the interior of a burn unit. Past experience has shown that the crew would spend up to 2 weeks prior to ignition to identify firing patterns and control lines that would meet objectives including retention of unique or sensitive wildlife habitats. This pre-treatment field review would identify control lines and firing patterns necessary to ensure that any inclusion of MS habitat would not be burned.
- **PDF WL-28 –** The stands where this design feature will be used contain multi-story hare habitat and occur within the CWPP WUI, but outside the WUI 2-mile zone. Treatment is proposed because they occur close to existing structures on private land and the Stonewall Interdisciplinary Team felt they were at risk from wildfire. Also units 46 and 47 contain an aspen component and scattered large ponderosa pine and release is necessary to maintain these inclusions. Under alternative 2, both units would receive an improvement cut followed by underburning. This treatment was modified under alternative 3 to retain various habitat components within the units. Under Alternative 3, approximately 50 percent of these units would not receive an improvement cut and fuels would be piled and jackpot burned (vs. underburning in alternative 2).

  This design feature also requires that these units be laid out with a wildlife biologist so that fuels can be reduced and aspen effectively released and maintained, while minimizing effects to multi-story habitat. It should also be noted that under alternative 3, 128 acres of precommercial thinning (unit 75) was dropped between these two units (46 and 47), so that in addition to maintaining more den and winter foraging habitat, these changes would collectively maintain lynx travel corridors for approximately 2 miles along the southern project boundary.

Regeneration harvest: Under both action alternatives, regeneration harvest is prescribed for dense lodgepole pine stands or stands with a mix of ponderosa pine and lodgepole pine which have concentrated MPB mortality. Approximately 80 percent of the regeneration harvest under both alternatives occurs in mid-seral habitats that presently have a poorly developed understory and are not currently considered snowshoe hare habitat. The remainder would occur in multi-storied (MS) or stand initiation (SI) stands within the WUI that currently support snowshoe hare habitat.

This proposed treatment removes or alters stand structure, and eliminates snowshoe hare foraging/cover and lynx cover until the site is regenerated. It can also reduce existing potential for denning and red squirrel habitat by removing large trees and down logs on the site (Ruediger et al. 2000). Regeneration harvest can also alter lynx movement through a stand, although this varies seasonally and temporally. For example, because they have deep snow and provide little horizontal cover for hares, clearcuts were avoided during the winter, whereas when dense deciduous shrubs and saplings were available to support hares, there was no evidence of avoidance in summer (Squires et al. 2010).

Treatment would create early successional conditions including dense understories preferred by snowshoe (USDA Forest Service 2007a, appendix P) and winter foraging habitat would be created within 10 to 30 years. Implementation of pdfs WL-5 through WL-9 will provide for retention of snags and downed woody debris that will help promote restoration of denning habitat conditions.

Intermediate harvest: This activity occurs in stands that are dominated by lodgepole pine or contain a mix of Douglas-fir and lodgepole pine (with small amounts of ponderosa pine/spruce) that have been affected by recent MPB mortality. The availability of down wood for denning habitat is variable and generally ranges from five to twenty tons per acre, with a few stands having 30 tons per acre. Stands proposed for treatment also contain a large number of mid-sized lodgepole snags. All intermediate harvest units occur within the WUI and are near private land/structures that are at risk from wildfire. Approximately 50 percent of the improvement cutting under both alternatives would occur in mid-seral habitats that presently have poorly developed understory conditions and do not support snowshoe hare habitat. The remainder would occur in MS and SI stands.

Partial or intermediate treatments remove understory and overstory vegetation, reduce the availability of down wood and denning habitat, and reduce any existing forage opportunities for snowshoe hare. This reduction in habitat may be due to the harvest of trees, or due to mechanical operations that create skid trails or damage to understory vegetation. These treatments can also modify vegetation structure that contributes to red squirrel habitat (Ruediger et al. 2000) and the quality of red-squirrel habitat could be reduced.

Lynx in the Northern Rockies are sensitive to changes in forest structure (Squires 2013, Koehler 1990, Squires 2010). Because proposed treatments would reduce overstory and understory cover and remove down wood, snowshoe hare habitat and the quality of lynx den and foraging habitat would be reduced over the short and long-term (greater than 10 years) (Squires 2013, Squires 2010). Thinning can also affect lynx movement across the landscape and can alter lynx distribution within their home range (Squires et al. 2006, Squires et al. 2010).

Use of treatments sites by hare and lynx will vary temporarily and by site and alternative. Between 25 and 40 percent canopy closure would be maintained under alternative 2, depending on the level of existing mortality. The treatments would remove dead/infested trees, and other less vigorous trees to reduce susceptibility to insects, disease and catastrophic fire. Improvement cutting prescriptions under alternatives 2 and 3 are similar, except that greater than 40 percent canopy closure would be maintained on most sites under alternative 3. While understory conditions would be variable, existing regeneration that is experiencing poor vigor would be released and harvest and reforestation treatments would promote establishment of shrubs and understory conifer, providing hare habitat in the future. Retention of snags, down wood and large logs, combined with future dead wood recruitment would promote restoration of denning habitat treatment. Consequently there is a tradeoff between an initial reduction in hare/lynx habitat versus improved stand vigor/health and reducing the risk of catastrophic wildfire within the WUI, both of which would promote the long-term sustainability of lynx habitat.

Precommercial thinning: Precommercial thinning involves thinning young trees, which reduces the density of sapling-sized conifer trees and understory shrubs and therefore reduces available snowshoe hare habitat (Ruediger et al. 2000). Treatment is designed to reduce fuels in close proximity to private lands and all precommercial thinning occurs within the wildland urban interface. Winter foraging habitat would be reduced for 15 to 20 years and treatment within stand initiation habitat would result in a return to unsuitable stand initiation habitat conditions. Potential den habitat would also be reduced, although pdfs that retain snags and DWD would help to restore den habitat.

Pile and jackpot burning: Burning piles or concentrations (jackpots) of fuels is completed in association with a timber harvest and has little additional impact on lynx foraging habitat conditions. Depending upon the methods used to develop the fuel piles and how densely packed they are, this activity could reduce the quality of any potential denning habitat that may occur within fuel piles. Fuels that are piled by hand or grapple hooks tend to receive greater use as wildlife cover because they are less dense and contain less dirt and small debris than those that are pushed into piles by bladed equipment.

Broadcast burning: This treatment prescription includes sites proposed for low severity burning or underburning, as well as most of the sites (55 percent) proposed for mixed severity burning. Approximately 94 percent of the proposed burning under alternative 2 and 98 percent under alternative 3 occur in mid-seral habitat that presently has poorly developed understory conditions.

Because this treatment kills young trees and reduces small diameter woody debris, broadcast burning is expected to reduce available forage and cover on portions of the sites burned. Approximately 20 percent of the burning sites would be unaffected by the fire resulting in a mosaic of burned and unburned conditions. Because the pdfs discussed above would retain snags, DWD, and pockets of understory shrubs and vegetation, most existing denning and foraging habitat would still be retained within all treatment units. Broadcast burning is expected to stimulate regrowth of many herbaceous plants that are beneficial to snowshoe hares during summer, as well as provide the heat necessary to release seeds of conifers with serotinous cones. So while cover and forage would be reduced for 5 to 10 years, burning would also be expected to result in establishment of tree seedlings and shrubs and improve foraging habitat over the long term. Similarly, due to the retention and additional future recruitment of downed woody debris, denning habitat would be restored within a few years of treatment.

Mixed-severity burning: Mixed-severity burning will exhibit a wide range of effects on vegetation resulting in a mosaic of conditions ranging from unburned (20 percent of the site), to lightly burned (55 percent of the site) and moderate to severe fire (25 percent of the site). Over 95 percent of the mixed severity burning under both alternatives is proposed in mid-seral habitat that presently has poorly developed understories and do not currently support snowshoe hares. The remainder is proposed for stands that are classified as MS, however with implementation of pdfs, any existing inclusions of winter hare habitat should remain unburned and there would be little actual reduction in current habitat availability for snowshoe hares. Effects of lightly burned areas would be similar to those discussed above for broadcast burning. Moderate to severe fire would create overstory canopy openings of various sizes ranging from 10 to 75 acres. Due to the canopy reduction resulting from higher severity fire, approximately 25 percent of the acres proposed for mixed severity treatment would have a long-term reduction (greater than 10 years) in the understory and unsuitable stand initiation habitat conditions would be created on this acreage. There would also be an immediate reduction in potential denning habitat in fire created openings due to loss of down wood; however this is expected to improve within five to ten years due to the large quantities of down wood which would be created in these openings.

Mature forest stands that have openings created through fire can provide snowshoe hare habitat and over time (greater than 15 years) as the understory develops, winter foraging habitat would be created within these openings. Also due to the recruitment of dead wood from fire mortality, denning habitat potential would be restored or improved within these openings within 5 to 10 years of treatment. So while treatment would result in a short-term reduction in denning and summer foraging habitat, because all units would have a mosaic of burned and unburned lands and considering no winter foraging habitat would be treated, all units would retain den and foraging habitat in the short term and improve the amount and distribution of den and winter foraging habitat over the long-term.

Road Construction and Maintenance: While there is no evidence that suggests that forest roads pose a threat to lynx (USDA Forest Service 2007b, p. 3), road construction may reduce lynx habitat by removing forest cover and winter road use may provide access for lynx competitors. Conversely lynx have been documented using less traveled roads where the adjacent vegetation provides good hare habitat and Squires et al. (2010) concluded that forest roads with low vehicular or over-snow vehicle traffic had little effect on lynx seasonal resource-selection patterns in Montana. While preliminary information suggests lynx do not avoid roads (USDA Forest Service 2007b, p. 26), potential impacts are reduced when access, traffic volume and road speed are reduced.

Effects of Project Alternatives on Lynx Habitat

The following sections discuss and compare the expected effects of implementing each proposed action alternative on lynx and lynx habitat conditions and how each alternative relates to compliance with NRLMD standards and guidelines. Table 96 and table 97 display mapped lynx habitat affected by the treatment types discussed above under alternatives 2 and 3. Effects of these activities with respect to compliance with NRLMD objectives, standards and guidelines are also discussed and summarized in table 98, table 99 and table 100.

As illustrated in table 96 and table 97, Alternative 3 was designed in part to reduce effects to lynx and lynx habitat. Alternative 3 proposes reductions in regeneration harvest, intermediate harvest, and pre-commercial thinning by 16 percent, 47 percent, and 77 percent respectively, with a corresponding decrease in the expected effects of those treatments. Alternative 3 would also reduce both the total amount of burning by 15 percent, and decrease the overall proportion of mixed severity burning. In order to maintain more understory vegetation within harvest sites, jackpot burning is increased under Alternative 3 and understory burning following harvest is reduced. The following is a summary of the differences between alternative 2 and alternative 3 by LAU:

- Blackfoot 07 – Alternative 3 would drop 878 acres of mixed severity burning, 122 acres of low severity burning, 339 acres of improvement cutting and 260 acres of precommercial thinning. Benefits to lynx resulting from these changes include maintaining approximately 180 acres more SI winter hare habitat and reducing effects to potential denning habitat on approximately 800 acres in the Lincoln Gulch and Beaver Creek drainages. Because lands in the Beaver Creek drainage were identified by Squires et al (2013) as part of a dispersal corridor utilized during the summer months, these changes would also help facilitate movement within BL-07, as well as between BL-07 and BL-08 and with lands to the south. Roads built and then obliterated at the end of the project would be reduced from 2.6 to 0.4 miles and effects associated with new road construction in the Lincoln Gulch drainage would also be reduced.
- Blackfoot 08 – Alternative 3 drops 629 acres of mixed severity burning, 47 acres of low severity burning, and 50 acres of pre-commercial thinning near the eastern boundary. It also reduces improvement cutting by approximately 80 acres and replaces underburning with jackpot burning. Benefits to lynx habitat resulting from these changes include maintaining 90 acres more MS winter hare habitat, and reducing effects to potential den habitat on approximately 590 acres. Lands where treatment is reduced are also part of the summer/winter dispersal corridor identified by Squires et al. (2013), and changes would have fewer effects to lynx movement within BL-08, as well as between BL-07 and BL-08 and lands to the south.

Table 96. Lynx habitat within BL-07 affected by treatment

Treatments	**Lynx Habitat BL-07**									
	Multi-storied 8,402 acres available		**Stand Initiation 1,312 acres available**		**Mid-seral 7,431 acres available**		**Stem Exclusion 156 acres available**		**Unsuitable Stand Initiation 331 acres available**	
	Alt 2	**Alt 3**	**Alt 2**	**Alt 3**	**Alt 2**	**Alt 3**	**Alt 2**	**Alt 3**	**Alt 2**	**Alt 3**
	Total Acres Treated[1]									
	527	**289**	**460**	**230**	**2,284**	**1,646**	**9**	**0**	**34**	**33**
Treatment Summary										
Intermediate Harvest	**298**	**170**	**439**	**210**	**546**	**382**	**9**	**0**	**20**	**17**
Improvement Cut	286	162	7	6	282	138	0	0	3	0

Treatments	Lynx Habitat BL-07									
	Multi-storied 8,402 acres available		Stand Initiation 1,312 acres available		Mid-seral 7,431 acres available		Stem Exclusion 156 acres available		Unsuitable Stand Initiation 331 acres available	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
	Total Acres Treated[1]									
	527	**289**	**460**	**230**	**2,284**	**1,646**	**9**	**0**	**34**	**33**
Sanitation Cut	0	0	0	0	22	22	0	0	0	0
Pre-commercial Thinning	12	8	432	204	242	222	9	0	17	17
Regeneration Harvest	**107**	**91**	**21**	**20**	**566**	**464**	**0**	**0**	**7**	**7**
Clearcut	27	12	5	5	157	112	0	0	6	6
Shelterwood/ Seedtree	80	79	16	15	409	352	0	0	1	1
Burning Only	**122**	**28**	**0**	**0**	**1,172**	**800**	**0**	**0**	**7**	**9**
Low Severity	32	0	0	0	0	12	0	0	0	0
Mixed Severity	90	11	0	0	1,172	667	0	0	7	7
Jackpot/Hand Burning	0	0	0	0	0	0	0	0	0	0
Underburning	0	17	0	0	0	121	0	0	0	2
Secondary Treatments										
Burning in Harvest Sites	**397**	**255**	**196**	**65**	**870**	**684**	**0**	**0**	**7**	**10**
Underburn/Site Prep Burn	363	123	164	56	690	596	0	0	7	10
Jackpot Burn	34	132	32	9	180	88	0	0	0	0

[1]-Total does not include secondary treatments, i.e.,burning in harvest sites to avoid counting duplicate acres.

Table 97. Lynx habitat within BL-08 affected by treatment

Treatments	BL-08 Lynx Habitat Acres									
	Multi-storied 3,511 acres available		Stand Initiation 659 acres available		Mid-seral 9,015 acres available		Stem Exclusion 373 acres available		Unsuitable Stand-initiation 7,864 acres available	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
	Total Acres Treated[1]									
	240	**146**	**0**	**0**	**2,320**	**1,898**	**0**	**0**	**0**	**2**
Treatment Summary										
Intermediate Harvest	**199**	**127**	**0**	**0**	**289**	**247**	**0**	**0**	**0**	**0**
Improvement Cut	194	127	0	0	3	3	0	0	0	0
Sanitation Cut	0	0	0	0	0	0	0	0	0	0
Pre-commercial Thinning	5	0	0	0	286	244	0	0	0	0

Treatments	BL-08 Lynx Habitat Acres									
	Multi-storied 3,511 acres available		Stand Initiation 659 acres available		Mid-seral 9,015 acres available		Stem Exclusion 373 acres available		Unsuitable Stand-initiation 7,864 acres available	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
	Total Acres Treated[1]									
	240	**146**	**0**	**0**	**2,320**	**1,898**	**0**	**0**	**0**	**2**
Regeneration Harvest	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Clearcut	0	0	0	0	0	0	0	0	0	0
Seedtree/ Shelterwood	0	0	0	0	0	0	0	0	0	0
Burning Only	**41**	**19**	**0**	**0**	**2,031**	**1,651**	**0**	**0**	**0**	**2**
Low Severity	1	1	0	0	36	38	0	0	0	0
Mixed Severity	40	2	0	0	1,995	1,560	0	0	0	2
Jackpot Burning	0	16	0	0	0	53	0	0	0	0
Underburning	0	0	0	0	0	0	0	0	0	0
Secondary Treatments										
Burning in Harvest Sites	**199**	**127**	**0**	**0**	**286**	**247**	**0**	**0**	**0**	**0**
Underburn/Site Prep Burn	199	37	0	0	286	192	0	0	0	0
Jackpot Burn	0	90	0	0	0	55	0	0	0	0

[1]-Total does not include secondary treatments, i.e.,burning in harvest sites to avoid counting duplicate acres.

Proposed regeneration treatments occur in areas with concentrated MPB mortality and regeneration harvest and reforestation treatments are designed to reduce fuels and wildfire risk, increase understory species diversity (including fire-tolerant species and hardwoods), and promote the long-term sustainability of forested habitat. As a result, treatments under both action alternatives are in compliance with VEG G1. Because unsuitable stand initiation habitat would remain well below 30 percent in BL-07 and new unsuitable stand initiation habitat within the WUI in BL-08 would be covered by fuel treatment exemptions under the NRLMD (see WUI summary below), and less than 15 percent of the lynx habitat on NFS lands within affected LAUs would be regenerated during a 10-year period, both action alternatives are in compliance with VEG S1 and VEG S2. Because all MS and SI habitat proposed for treatment occurs within the WUI, treatments are in compliance with VEG S5 and VEG S6. Finally, 80 percent of the treatment would occur in stands that presently lack a developing understory. As a result and considering treatment would promote development of future SI habitat, increase hardwood and conifer species diversity, and reduce the risk of future wildfire, proposed regeneration treatments would help promote the long-term sustainability of lynx habitat and both action alternatives are in compliance with VEG G10.

Proposed intermediate harvests, and associated post-harvest burning, are designed to reduce fuels, future conifer mortality and wildfire risk, promote development of herbaceous and woody (shrub and conifer) vegetation in the understory, and promote or maintain aspen. Approximately half of the intermediate harvest is proposed in mid-seral habitat which presently does not provide winter hare habitat, and treatment would result in development of future MS habitat. As a result, both action alternatives are in compliance with VEG G1 and VEG O4. Because all MS and SI habitat affected occurs within the WUI, treatments are in compliance with VEG S5 and VEG S6. Finally, because both alternatives retain between 92 and 95 percent of the existing winter hare habitat within affected LAUs, increase species and structural diversity within treatment sites, promote development of future MS habitat in mid-seral habitat, and reduce the risk of stand-replacing wildfire, treatment would promote the long-term sustainability of lynx habitat and are in compliance with VEG G10.

Precommercial thinning treatments are designed to reduce wildfire risk to private land and structures, while promoting development of large diameter trees and conifer diversity and reducing future insect and disease related mortality. Because all proposed precommercial thinning occurs within the CWPP WUI, both action alternatives comply with VEG G1 and VEG S5. About 78 percent of the stand initiation habitat was initially avoided (alternative 2) and thinning was only proposed on lands that pose a risk to private land/structures from wildfire. Also Alternative 3 was developed to retain approximately 90 percent of the existing stand initiation habitat. As a result, the Stonewall Vegetation Management Project was designed considering VEG S5 and complies with VEG G10.

Pile and jackpot burning treatments are designed to reduce fuels and the risk of wildfire within the wildland urban interface. Also this treatment is used in combination with intermediate or regeneration harvest activities and would help to achieve objectives described under these treatments. As a result, treatment is in compliance with VEG G1 and VEG G10 under both action alternatives.

The proposed broadcast burning is designed to achieve a variety of objectives including, restoring historic levels of fire to the landscape, reducing fuels and wildfire risk, increase understory herbaceous and woody (shrubs) vegetation, promote the development of fire tolerant conifer species, and maintain or enhance aspen. Also, all MS habitat proposed for treatment occurs within the WUI and most treatment occurs on lands that have poorly developed understories. Collectively, for these reasons, treatment proposed under both action alternatives would promote the long-term sustainability of lynx habitat and are consistent with VEG O4, VEG G1, VEG G10, and VEG S6. Both action alternatives are in compliance with VEG G4 because habitat and travel corridors along ridgelines would be maintained, and most burning is proposed on steeper sideslopes, and incorporates retention of un-burned lands within the treatment units. Because 20 percent of the sites would be left un-burned and treatment prescriptions require retention of large diameter trees and enhancement of conifer regeneration, potential habitat for alternate species such as red squirrel would be maintained and treatment under both action alternatives is consistent with VEG G5. Finally, because burning would help restore the historic role of fire to the landscape, as well as increase landscape level diversity, these proposed treatments are consistent with VEG O1, VEG O2, and VEG O3.

Mixed-Severity burning treatments would create a variety of conditions on the site and are designed to restore historic levels of low and mixed severity fire to the landscape, reduce fuels and wildfire risk, promote landscape diversity including future MS and SI habitat, and maintain or enhance species diversity including aspen, white bark pine, fire tolerant conifers and herbaceous and woody understory conditions. All MS habitat proposed for treatment occurs within the Tri-County WUI. Over 95 percent of the treatment occurs in mid-seral stands that currently have a poorly developed understory. As a result, treatments are expected to promote the long-term sustainability of lynx habitat while reducing wildfire risk and treatment under both alternatives are in compliance with VEG O4, VEG G1, VEG G10, VEG S1 and VEG S6. Like underburning, due to the restoration of fire and increased landscape diversity, these treatments are consistent with VEG O1, VEG O2 and VEG O3. Because 20 percent of the sites would be left un-burned and due to retention of large diameter trees and downed wood, potential habitat for alternate species such as red squirrel would be maintained, making these treatments consistent with VEG G5.

With respect to roads necessary to implement proposed treatments, no new permanent roads are proposed under either action alternative nor does either alternative proposed changes in access management following implementation. Roads built and then obliterated after project activities will be utilized, with 2.6 miles and 0.4 miles in use in BL-07 under alternatives 2 and 3, respectively. No new roads are proposed in BL-08. All new roads to be constructed occur in portions of BL-07 that are already well roaded and they will not affect linkage areas or travel corridors identified by Squires et al. (2013). In summary, because no new permanent roads would be constructed, unroaded areas would be unaffected, and roads to be constructed would be closed to public access during implementation and obliterated following use, proposed roads under either action alternative would not be expected to increase long-term public access or open up new lands to possible competition from other predators.

NRLMD guidelines HU G6, HUG7, HU G8 and HU G9 restrict new permanent road construction in linkage areas and lands important to lynx movement, reduce potential impacts associated with public access and identify road maintenance and management considerations to reduce impacts to lynx. Because neither action alternative proposes upgrading unpaved roads to maintenance levels 4 or 5, both are in compliance with HU G6. Because no new permanent road construction is proposed, both action alternatives are in compliance with HU G7. With implementation of PDFs that limit the cutting of brush to the minimum necessary to meet public safety, both action alternatives are in compliance with HU G8. Finally, because new roads built and then obliterated at the end of project activities would be closed to public access during project implementation (approximately 5 years), both action alternatives are in compliance with HU G9.

Wildland Urban Interface Summary

All of the timber harvest units occur within the Tri-County CWPP WUI, whereas 49 percent of prescribed burn units in BL-07 and 32 percent of prescribed burn units BL-08 occur within the WUI. Outside the WUI prescribed burning would be focused on treating mid-seral habitats that within burn units represent 83 percent of mapped lynx habitat in BL-07 and 94 percent of mapped lynx habitat in BL-08 outside the WUI. Neither alternative proposes burning in multi-story or stand initiation habitat outside the WUI. Multi-storied habitat comprises 16 percent of lynx habitat outside the WUI in BL-07 and 6 percent in BL-08. Stand initiation habitat winter hare habitat is not present in any of the burn units outside the WUI and unsuitable stand habitat initiation habitat comprises approximately 1 percent and 2 percent of burn units in BL-07 and BL-08 respectively. As proposed under the action alternatives, not all of the units are intended to be burned therefore patches of multi-storied habitat outside the WUI would be avoided during prescribed fire treatments. Also, through implementation of project design features that restrict treatment within inclusions of multi-story or stand initiation habitat, there is no winter hare habitat proposed for treatment outside the WUI under either action alternative. In addition, burn treatments would emphasis the retention of multi-storied habitat beyond the 2-mile zone of the WUI although treatment is allowed under the NRLMD exemptions for fuels reduction projects within the wildland urban interface.

The Northern Rockies Lynx Management Direction recognized the need to reduce wildfire risk and exempts a limited amount of treatment of suitable lynx habitat within a WUI, although certain restrictions apply (USDI Fish and Wildlife Service 2007b). All proposed treatments within winter hare habitat under both action alternatives occur only in the WUI and are consistent with the limitations identified in standards VEG S1, VEG S2, VEG S5 and VEG S6 in the NRLMD (USDA Forest Service 2007b).

Habitat Connectivity

Maintaining landscape level connectivity between lynx habitat, particularly in the southern extension of its range is important to ensure lynx conservation in the Northern Rockies (Squires et al. 2013, USDA Forest Service 2007b). Based on radio tracking data collected in Montana, Squires et al. (2013) identified patches of habitat capable of supporting lynx that are currently being utilized as travel corridors. The approximate locations of these corridors are displayed in figure 82. It is known that lynx are sensitive to changes in forest structure and tend to avoid openings (Koehler 1990, Squires et al. 2010, Squires 2013) and that due to the structural changes described under treatment effects, openings created by timber harvest can reduce connectivity and alter the movement and distribution of lynx within their home range and across the landscape (Squires et al. 2006, Squires et al. 2013). Although lynx movements might be altered by the openings that will be created in portions of sites receiving timber harvests and/or mixed severity burning treatments in either action alternative, from a landscape perspective, these sites are scattered, interconnected with unaffected habitat, and mimic openings created by natural disturbances. It is not expected that prescribed treatments under either action alternative would reduce connectivity between or within LAUs. Also, as described under treatment effects, the proposed roads to be built and then obliterated after use under the action alternatives will not isolate any forest patches and do not occur on lands that are being used for dispersal (Squires et al. 2013).

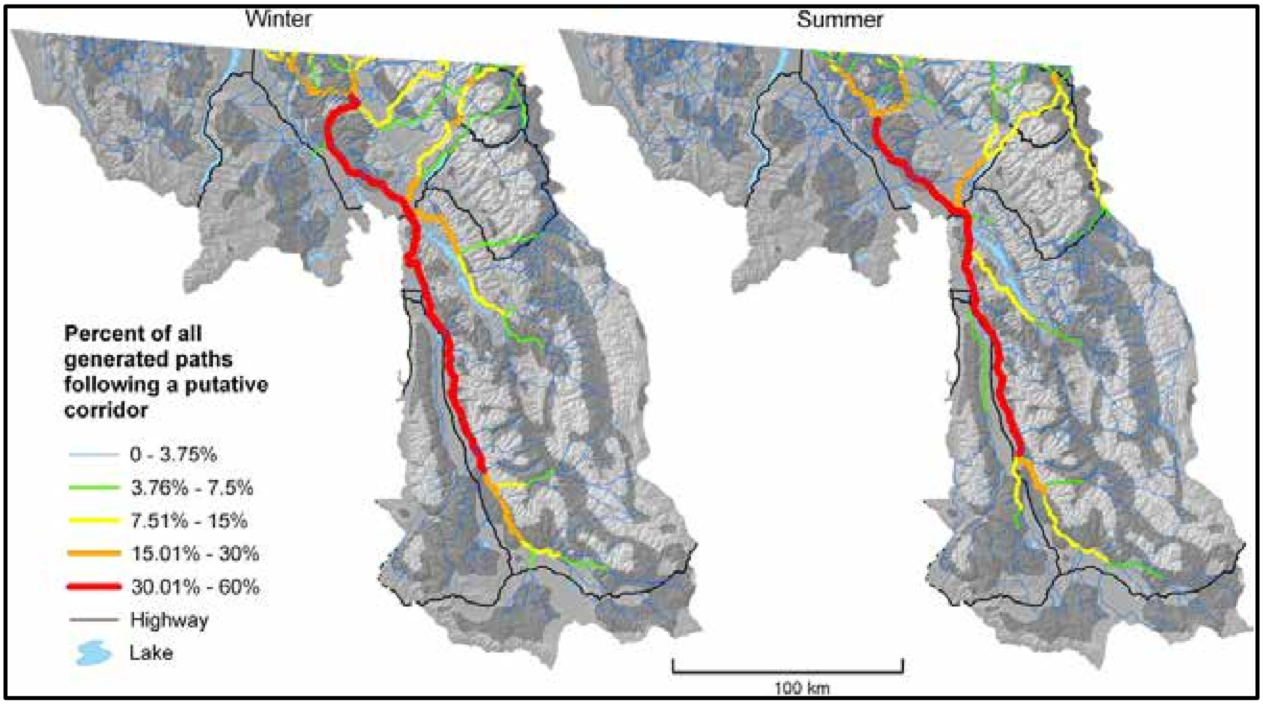


Figure 82. Lynx movemrnt corridors from Squires et al. 2013

Snow Compaction

Although NRLMD Objective HU 01 does not apply directly to vegetation management projects, it pertains to snow compaction and maintaining the lynx's natural competitive advantage over other predators in deep snow by discouraging the expansion of snow compacting activities in lynx habitat. There are currently 12 miles of designated snowmobile trails within the Stonewall Vegetation Management Project area including the Beaver Creek/Dry Creek Trail (7 miles groomed), the Sucker Creek Road (1 mile groomed), the Stonewall Mountain trail (3 miles ungroomed) and the trail near Reservoir Lake (1 mile ungroomed), whereas the Copper Bowls area north of the project area seems to be the most popular destination for cross-country snowmobiling.

While the Stonewall Vegetation Management Project would not change any motorized route designations or increase groomed trails, all project area lands where timber harvest is proposed are currently open to cross-country travel by snowmobiles and the creation of more open forest conditions by some treatments and the proximity to roads may enhance opportunities for snowmobiling. The greatest potential for increased snowmobile use would occur within sites proposed for regeneration harvest. Since regeneration cuts would not provide winter snowshoe hare habitat for 10-30 years following harvest the impact of snowmobile use upon lynx or snowshoe hares in these units would be minimal. In intermediate harvest units snowmobile use and the potential impacts upon lynx use would be more variable dependent upon residual forest structure including understory and down wood retention until regeneration limits access by snowmobiles. The potential for increased snowmobile use within prescribed burn only units is anticipated to be considerably less since most units occur away from roads with access limited by topography and forest cover. Access to burn units would continue to be limited by live forest cover retained on unburned lands and the retention of standing dead and much of the down material within burned areas. Finally, research in northwestern Montana concluded that there is little evidence that compacted snowmobile trails increased exploitation competition between coyotes and lynx during the winter, suggesting that compacted snow routes did not appear to enhance coyotes' access to lynx and hare habitat and do not significantly affect competition for snowshoe hare (Kolbe et al. 2007). Collectively, for these reasons and considering anecdotal information suggests that lynx are not displaced by human presence, including moderate levels of snowmobile traffic (Mowat et al. 2000, Squires 1999, G. Byrne 1999), it is anticipated that increases in cross-country snowmobile use will have minimal impact upon lynx's competitive advantage over other predators in deep snow. Both action alternatives comply with HU-O1.

Grazing

Approximately 5,900 acres of mapped habitat would continue to be affected by grazing. While understory vegetation will be affected, existing lynx use is not expected to change. As a result, and with implementation of pdfs to reduce grazing impacts through monitoring and management changes, effects to recovering vegetation, winter forage and cover, and aspen, would be reduced. Finally there is no evidence that grazing is a factor threatening lynx (USDI Fish and Wildlife Service 2007b) and there are no long-term adverse effects to lynx anticipated by either action alternative. As a result, both action alternatives are in compliance with GRAZ O1, GRAZ G1, GRAZ G2, and GRAZ G3 as defined in the NRLMD.

Red Squirrel Habitat

NRLMD objectives include providing habitat for alternate prey species, primarily red squirrel in each LAU (VEG G5). Red squirrel habitat would be reduced over the long-term on sites proposed for regeneration harvest, and high severity burning, whereas the quality of red squirrel habitat would be reduced on sites proposed for improvement cutting. Under alternative 2 this would occur on approximately 10 percent of suitable red squirrel/lynx habitat in BL-07 and five percent of BL-08. Under alternative 3 red squirrel habitat would be reduced on 5 percent and 3 percent of the suitable habitat in BL-07 and 08 respectively.

While both action alternatives would reduce the amount and quality or red squirrel habitat, over 90 percent of the existing habitat would be left unaffected under both action alternatives. Also most of the reduction in mature forest would result from openings created by mixed-severity fire, and suitable habitat would be maintained on 75 percent of the treatment unit. Finally treatments would maintain or promote tree diversity and seed production while reducing the risk of catastrophic wildfire, which would maintain or improve red squirrel habitat over the long term. Collectively for these reasons, habitat for alternate prey species would continue to be available in both BL-07 and BL-08, and alternatives 2 and 3 both comply with VEG G5.

Denning Habitat Summary

NRLMD VEG G11 requires that denning habitat should be distributed in each LAU in the form of pockets of large amounts of coarse woody debris, either as down logs, root wads or large piles of wind thrown trees. Due to widespread MPB mortality and decades of increased stocking, snags and downed wood are readily available across the landscape. Also with implementation of PDFs, downed wood, including a component of large diameter logs would be retained in all treatment units, which would help to maintain or restore den habitat. Further, implementation of INFISH buffers and maintaining unburned lands on sites proposed for burning would further maintain dead wood and den habitat within treatment sites. Denning habitat would continue to be well distributed within both affected LAUs and both action alternatives are in compliance with VEG G11.

Unsuitable Stand Initiation Habitat Summary

VEG S1 requires that each LAU have no more than 30 percent of the lynx habitat in the unsuitable stand initiation structural stage. Unsuitable stand initiation habitat currently exists on approximately two percent of the mapped lynx habitat within BL-07. Project activities will increase this percentage, but it will remain well under the 30 percent limitation required by the NRLMD. Because less than 30 percent of BL-07 would occur as unsuitable stand initiation habitat, both action alternatives are in compliance with VEG S1 for BL-07.

Approximately 37 percent of the mapped lynx habitat within BL-08 currently exists as unsuitable stand initiation habitat; with most of this resulting from the 2003 Snow Talon fire. While there is no regeneration harvest or pre-commercial thinning proposed in mapped habitat in BL-08 under either alternative, mixed severity burning may create up to 509 acres of additional unsuitable stand initiation habitat under alternative 2 and up to 390 additional acres under alternative 3 (25% of the planned mixed severity burning by alternative). Unsuitable early stand initiation habitat in this LAU already exceeds 30 percent of the mapped lynx habitat. Therefore, implementation of these activities will require utilization of the fuel treatment exemption allowed under the NRLMD. Because it will take 10 years to complete proposed burning and considering large stand replacing fires produce high quality winter snowshoe hare habitat after approximately 10 to 30 years (USDI Fish and Wildlife Service 2007b); it is expected that some of the currently unsuitable stand initiation habitat created by the Snow Talon fire will develop into suitable hare habitat before the Stonewall Vegetation Management Project is completed, thereby reducing the overall percentage of unsuitable stand initiation habitat, ultimately allowing it to fall below the 30 percent desired maximum described by the NRLMD. Until then, the fuel treatments prescribed under either action alternative fall under the allowable exemption described in VEG S1 and VEG S6, and treatment acreage will be deducted from the prescribed Helena National Forest allocation.

As a result, proposed activities in BL-08 that are outside the WUI will be deferred until sufficient regeneration has occurred within the burned portion of the LAU to support hare and lynx winter use.

Summary of Habitat Changes For Lynx Analysis Units BL-07 and BL-08

Expected changes by alternative and compliance with NRLMD vegetation standards are displayed in table 98 and table 99 and table 100 for BL-07 and BL-08.

Table 98. Blackfoot 07 alternative lynx habitat

Habitat/Condition	Alternative 1	Alternative 2		Alternative 3	
	Existing Acres	Acres	Change	Acres	Change
Habitat Conditions					
Total acres	**26,662**	**26,662**	**0**	**26,662**	**0**
Acres mapped lynx habitat	17,632	17,632	0	17,632	0
Acres winter hare habitat	9,714	8,751	-987	9,201	-519
Acres of unsuitable stand initiation habitat	331[1]	1,780[1]	+1449	1,286[1]	+955
Compliance with VEG S1, VEG S2, VEG S5, VEG S6					
Acres of stand initiation hare habitat treated outside of the WUI	0	0	0	0	0
Acres of stand initiation hare habitat treated within the WUI	0	460	+460	230	+230
Acres of multi-story habitat treated outside the WUI	0	0	0	0	0
Acres of multi-story habitat treated within the WUI	0	527	527	289	+289
Meets VEG S1: No more than 30% of the lynx habitat currently in the unsuitable stand initiation structural stage. (17,632 acres x 30% = 5,290 acres	Yes 2% currently unsuitable[1]	Yes 10 percent in unsuitable condition[1]		Yes 7% in unsuitable condition[1]	
Do three or more adjacent LAUs exceed VEG S1?	No	No		No	
Meets VEG S2: Timber management projects shall not regenerate more than 15% of lynx habitat in a 10-year period. (17,632 acres x 15% = 2,645 acres)	Yes 38 total acres regenerated by timber management in the past decade	Yes 739 total acres regenerated by timber management within 10 year period	701 acres new regeneration	Yes 620 total acres regenerated by timber management within 10 year period	582 acres new of regeneration
VEG S5: Precommercial thinning - Acres of stand initiation hare habitat treated within a WUI	0	439	+439	210	+210
VEG S5 cont'd – Acres of stand initiation hare habitat treated under exceptions 1-6	0	0	0	0	0
VEG S6: Multi-story habitat - Acres of multi-story habitat treated within the WUI	0	527	+527	289	+289
VEG S6 cont'd: Acres of multi-story habitat treated under exceptions 1-3	0	0	0	0	0
Meets VEG G10 – Fuel treatment projects within the WUI	Yes Meets See Table 40	Yes Meets See Table 40		Yes Meets See Table 40	

[1] - Due to development of stand initiation habitat by project completion (10 yrs), it is anticipated that the amount of unsuitable stand initiation habitat would be reduced from that displayed (see unsuitable stand initiation habitat summary). Treatment acreage in this category includes: all MS regeneration harvest; all SI regeneration harvest; all Mid-Seral regeneration harvest; all SI intermediate harvest; and 25% of mixed-severity burning only treatments

Table 99. Blackfoot 08 alternative lynx habitat

Habitat/Condition	Alternative 1	Alternative 2		Alternative 3	
	Existing Acres	Acres	Change	Acres	Change
Habitat Conditions					
Total acres	**27,549**	**27,549**	**0**	**27,549**	**0**
Acres mapped lynx habitat	21,422	21,422	0	21,422	0
Acres winter hare habitat	4,170	3,931	-240	4,024	-146
Acres of unsuitable Stand initiation habitat	7,864[1]	8,373[1]	+509	8,254[1]	+390
Compliance with VEG S1, VEG S2, VEG S5, VEG S6					
Acres of stand initiation hare habitat treated outside the WUI	0	0	0	0	0
Acres of stand initiation hare habitat treated within the WUI	0	0	0	0	0
Acres of multi-story habitat treated outside the WUI	0	0	0	0	0
Acres of multi-story habitat treated within the WUI.	0	240	+240	146	+146
Meets VEG S1: No more than 30% of the lynx habitat currently in the unsuitable stand initiation structural stage. (21,422 acres x 30% = 6,426 acres)	No 37% currently unsuitable[1]	No 39% in unsuitable condition[1]		No 39% in unsuitable condition[1]	
Do three or more adjacent LAUs exceed VEG S1?	No	No		No	
Meets VEG S2: Timber management projects shall not regenerate more than 15% of lynx habitat in a 10-year period. (21,422 acres x 15% = 3,213 acres)	Yes 495 total acres regenerated by timber management in the past decade	Yes 495 total acres regenerated by timber management in the past decade	0 acres new regeneration	Yes 495 total acres regenerated by timber management in the past decade	0 acres new regeneration
VEG S5: Precommercial thinning - Acres of stand initiation hare habitat treated within a WUI	0	0	0	0	0
VEG S5 cont'd: Acres of stand initiation hare habitat treated under exceptions 1-6	0	0	0	0	0
VEG S6: Multi-story habitat - Acres of multi-story habitat treated within the WUI	0	240	+240	146	+146
VEG S6 cont'd: Acres of multi-story habitat treated under exceptions 1-3	0	0	0	0	0

[1] - Due to development of stand initiation habitat by project completion (10 yrs), it is anticipated that the amount of unsuitable stand initiation habitat would be reduced from that displayed (see unsuitable stand initiation habitat summary). Treatment acreage in this category includes: all MS regeneration harvest; all SI regeneration harvest; all Mid-Seral regeneration harvest; all SI intermediate harvest; and 25% of mixed-severity burning only treatments.

Table 100. Summary of NRLMD Exemptions for Stonewall Vegetation Management Project

	Alternative 1 Acres	Alternative 2 Acres	Alternative 3 Acres
Original NRLMD Exemption Allowance (6% of lynx habitat on Helena National Forest)	**26,400**	**26,400**	**26,400**
Current Balance (October 2014)	**26,269**	**26,269**	**26,269**
Veg S1 exemptions (for BL-08)	0	509	390
Veg S5 WUI exemptions for PCT	0	439	210
Veg S6 WUI exemptions for snowshoe hare habitat reduction in MS stands by vegetation management	0	767	435
Total acres of treatment exceptions for Stonewall Vegetation Management Project	0	1,715	1,035
Revised Balance	**26,269**	**24,554**	**25,234**

NRLMD Lynx Risk Factors

Table 101 summarizes the applicable lynx management objectives, standards and guidelines and conservation measures to address factors affecting lynx productivity as outlined in the NRLMD (USDA Forest Service 2007b).

Table 101. Lynx amendment alternative comparison of objectives, standards and guidelines

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance: Alternative 2	Post-treatment Compliance: Alternative 3
ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL): The following objectives, standards, and guidelines apply to all management projects in lynx habitat in lynx analysis units (LAUs) and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression or, or to wildland fire use.			
ALL O1 – Maintain or restore lynx habitat connectivity in and between LAUs and in linkage areas.	Large areas of forested habitat are available across the analysis area. Moderate road densities of 1.9 to 2.8 miles/mi^2 occur within both LAUs although many existing roads are closed year-round	BL-07 and BL-08 - The forested character of the area would be retained and connectivity within and between LAUs would be maintained. The project would have no effect upon lynx linkage area and both action alternatives comply with ALL O1.	
ALL S1 – New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.	Large areas of forested habitat are present within both LAUs. Road densities are moderate to high, but most roads are closed year-round. Potential linkage corridors have been identified	BL-07 and BL-08 – No new or permanent developments are proposed. Stands proposed for vegetation treatment would be more open and there would be a reduction in cover on treatment sites. However, because (1) regeneration harvest is restricted to areas with concentrated MPB mortality, (2) sites proposed for burning would still maintain landscape level connectivity, and (3) open road densities would not increase and roads built then obliterated immediately following timber removal would occur in areas that are already roaded, existing linkage areas and connectivity within and between LAUs would be maintained. Both alternatives comply with ALL S1.	
VEGETATION MANAGEMENT PRACTICES AND ACTIVITIES (VEG): The following objectives, standards and guidelines apply to vegetation management projects in lynx habitat within lynx analysis units (LAUs) in occupied habitat. With the exception of Objective VEG 03 that specifically concerns wildland fire use, the objectives, standards, and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments such as mineral operations, ski runs, roads, and the like. None of the objectives, standards, or guidelines apply to linkage areas.			
VEG O1 – Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.	Fire has been excluded from the analysis area and stands are losing vigor. Edges between old and young forests are sharp due to past regeneration harvest. Existing stand initiation habitat is maturing providing less winter foraging habitat. Recent wildfire has reduced existing foraging and den habitat but would create future stand initiation habitat in portions of the project area LAUs. Widespread MPB mortality is increasing stand structure and den habitat.	BL-07 and BL-08 combined - Proposed treatments are designed to restore naturally occurring fire regimes and associated vegetative communities. Burning is proposed on 3,373 acres of mapped lynx habitat. Future wildfire risk would be reduced. 91% of existing winter forage habitat would be maintained. The distribution of foraging habitat across the landscape would be improved. Alternative 2 complies with VEG O1.	BL-07 and BL-08 combined - Proposed treatments are designed to restore naturally occurring fire regimes and associated vegetative communities. Burning is proposed on 2,509 acres of mapped lynx habitat. Future risk of wildfire are reduced. 95% of the winter foraging habitat would be maintained. The distribution of winter foraging habitat across the landscape would be improved. Alternative 3 complies with VEG O1.

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance	
		Alternative 2	Alternative 3
VEG O2 – Provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hares. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.	BL-07 - Multi-storied habitat has been increasing. Existing stand initiation is limited to a few stands created by past timber harvest and is widely scattered. BL-08 - Recent wildfires have reduced MS habitat and created a large block of currently unsuitable stand initiation habitat, much of which is expected to develop into suitable winter hare habitat within the next decade.	BL-07 and BL-08 combined – 94% and 77% of existing MS and SI habitat would be maintained in the short term. Over the long term, treatments would create SI habitat on 1,518 acres promoting horizontal and vertical structure and foraging habitat on approximately 5,800 acres. The distribution of foraging habitat would be improved across the landscape. Alternative 2 complies with VEG O2.	BL-07 and BL-08 combined – 96 and 88% of existing MS and SI habitat would be maintained in the short term. Over the long term, treatments would create SI habitat on 1,136 acres and promote horizontal and vertical structure and foraging habitat on approximately 4,200 acres. The overall distribution of foraging habitat would be improved across the landscape. Alternative 3 complies with VEG O2.
VEG O3 – Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.	Fire has been successfully suppressed within the project area since the early 1900s. Little prescribed fire has been implemented within the project area to date.	BL-07 and 08 combined - Prescribed fire activities that restore fire to the landscape and result in the long-term improvement in lynx habitat would occur on 3,373 acres. Treatment would occur within all watersheds over a 10-year period, increasing the amount and distribution of foraging habitat. Denning habitat would be maintained across the landscape while restoring the role of fire. Alternative 2 complies with VEG O3.	BL-07 and 08 combined - Prescribed fire activities that restore fire to the landscape and result in the long-term improvement in lynx habitat would occur on 2,209 acres. Treatment would occur within all watersheds over a 10-year period, increasing the amount and distribution of foraging habitat. Denning habitat would be maintained across the landscape while restoring the role of fire..Alternative 3 complies with VEG O3.
VEG O4 – Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.	Currently 55% of lynx habitat in BL-07 and 19% of lynx habitat in BL-08 provide winter snowshoe hare habitat.	BL-07 – 70% of the treatments are proposed in mid-seral or stem exclusion habitat that lacks a developing understory. Future winter snowshoe hare habitat would be created on 2,293 acres of existing mid-seral and stem exclusion habitat. BL-08 – 90% of the treatments are proposed in mid-seral habitat that lacks a developing understory. Future winter snowshoe hare habitat would be created on 2,320 acres of existing mid-seral habitat. Alternative 2 complies with VEG O4 for both BL-07 and BL-08	BL-07 – 75% of the treatments are proposed in mid-seral habitat that lacks a developing understory. Future winter snowshoe hare habitat would be created on 1,646 acres of existing mid-seral habitat. BL-08 – 93% of the treatments are proposed in mid-seral habitat that lacks a developing understory. Future winter snowshoe hare habitat would be created on 1,898 acres of existing mid-seral habitat. Alternative 3 complies with VEG O4 for both BL-07 and BL-08.

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance	
		Alternative 2	**Alternative 3**
VEG S1 – Unless a broad scale assessment has been completed that substantiates different levels of stand initiation structural stages, limit disturbance in each structural stage as follows: If more than 30% of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects. In addition, fuel treatment projects may not result in more than three LAUs exceeding the standard.	BL-07 – Currently 2% of total lynx habitat exists as unsuitable stand initiation habitat. BL-08- Currently 37% of total lynx habitat exists as unsuitable stand initiation habitat primarily due to the 2003 Snow-Talon fire.	BL-07 – Regeneration harvest, mixed severity burning, and thinning in SI habitat would increase unsuitable stand initiation habitat to 1,780 acres or 10% of llynx habitat within the LAU. Three or more adjacent LAUs would not exceed VEG S1. BL-08 – Mixed severity burning would increase unsuitable stand initiation habitat to 8,373 acres or 39% of the LAU. Three or more adjacent LAU's would not exceed VEG S1. The creation of new stand initiation is allowed as an exemption in NRLMD for fuel treatment within a WUI, but the creation of new stand initiation is not allowed outside the WUI when Veg S1 is exceeded. BL-08 – Because it would take 10 years to complete implementation of prescribed burning, no mixed severity burning would occur outside the WUI until sufficient regeneration has occurred in the existing unsuitable stand initiation habitat to meet the standard. Alternative 2 would comply with VEG S1 by deferring treatments in BL-08 until less than 30% of lynx habitat is in an unsuitable stand initiation stage.	BL-07 – Regeneration harvest, mixed severity burning, and thinning in SI habitat would increase unsuitable stand initiation habitat to 1,286 acres or 7% of the LAU. Three or more adjacent LAU's would not exceed VEG S1. BL-08 – Mixed-severity burning would increase unsuitable stand initiation habitat to 8,255 acres or 39% of the LAU. Three or more adjacent LAU's would not exceed VEG S1. The creation of new stand initiation is allowed as an exemption in NRLMD for fuel treatment within a WUI but the creation of new stand initiation is not allowed outside the WUI when Veg S1 is exceeded. BL-08 – Because it would take 10 years to complete implementation of prescribed burning, no mixed severity burning would occur outside the WUI until sufficient regeneration has occurred in the existing unsuitable stand initiation habitat to meet the standard. Alternative 3 will comply with VEG S1 by deferring treatments in BL-08 until less than 30% of lynx habitat is in an unsuitable stand initiation stage.

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance	
		Alternative 2	Alternative 3
VEG S2 – Timber management projects shall not regenerate more than 15% of lynx habitat on NFS lands within a LAU within a 10-year period.	Regeneration harvest on NFS lands in the last 10 years has included: BL-07 – 38 acres (<1 percent) BL-08 – 495 acres (2 percent)	BL-07 – A maximum of 701 new acres or 4% of the lynx habitat on NFS lands would be regenerated with timber harvest during this project. BL-8 – No regeneration harvest would occur within lynx habitat during the next 10-year period. BL-07 and BL-08 – Because less than 15% of the NFS lands within both LAUs would be regenerated, alternative 2 complies with VEG S2.	BL-07 – A maximum of 582 new acres or 3% of the NFS lands would be regenerated with timber harvest during this project. BL-8 – No regeneration harvest would occur within lynx habitat during the next 10-year period. BL-07 and BL-08 – Because less than 15% of the NFS lands within both LAUs would be regenerated, alternative 3 complies with VEG S2.
VEG S5 – Precommercial thinning projects that reduce snowshoe hare habitat, may occur from the stand initiation structural stage until the stands no longer provides winter snowshoe hare habitat only if they are: 1. within 200 feet of admin site, dwelling or outbuildings, 2. for research purposes, 3. if they are based on new information that has been peer reviewed, 4. for conifer removal in aspen or to restore whitebark pine. This applies to all precommercial thinning projects except fuel treatment projects that use precommercial thinning as a tool within the WUI as defined by HFRA. Fuel treatment projects within the WUI that do not meet VEG S1, VEG S2, VEG S5, and VEG S6, shall occur on no more than 6% of the lynx habitat on the Forest and would be designed considering standards VEG S1, VEG S2, VEG S5, and VEG S6 to promote lynx conservation (see VEG G10).	There has been no precommercial thinning in either LAU since 1997.	BL-07 – A total of 439 acres of stand initiation hare habitat would be precommercially thinned. All treatments lie within the WUI as identified in the CWPP and are designed to reduce the risk of wildfire to private lands and structures. Treatment would reduce the 26,400-acre (6%) forest limitation by 439 acres. BL-08 – No precommercial thinning would occur and alternative 2 meets the VEG S5 standard by utilizing the allowable exemption.	BL-07 – A total of 210 acres of the stand initiation hare habitat would be precommercially thinned. All treatments lie within the WUI as identified in CWPP and all treatments are designed to reduce the risk of wildfire to private lands/structures. Treatment within the WUI would reduce the 26,400-acre forest cap by 210 acres. BL-08 – No precommercial thinning would occur and alternative 3 meets the VEG S5 standard by utilizing the allowable exemption.
VEG S6 – Vegetation management projects that	There have been no vegetation	BL-07 – A total of 527 acres of the	BL-07 – A total of 289 acres of multi-storied

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance: Alternative 2	Post-treatment Compliance: Alternative 3
reduce snowshoe hare habitat in multi-story or late successional forests, may occur only if they are within 200 feet of admin site, dwelling or outbuildings, for research purposes, or for incidental removal during salvage harvest. This applies to all projects except fuel treatment projects within the WUI as defined by HEFRA. Fuel treatment projects within the WUI that do not meet VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6% of the lynx habitat on the administrative unit (Helena NF). Also fuel treatment projects should be designed considering VEG S1, S2, S5, and S6 (VEG G10).	management treatments within multi-storied habitat since 1996.	multi-storied hare habitat would be treated. All treatments are designed to reduce risk to private land/structures and all sites lie within the CWPP WUI. BL-08 – A total of 240 acres of multi-storied hare habitat would be treated. All treatments are designed to reduce risk to private land/structures and all sites occur within the CWPP WUI. Alternative 2 meets the VEG S6 standard by utilizing the allowable exemption.	hare habitat would be treated. All treatments are designed to reduce risk to private land/structures and all treatments lie within the CWPP WUI. BL-08 – A total of 146 acres of multi-storied hare habitat would be treated. All treatments are designed to reduce risk to private land/structures and all treatments occur within the CWPP WUI. Alternative 3 meets the VEG S6 standard by utilizing the allowable exemption.
VEG G1 – Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g., mesic monotypic lodgepole stands).	No vegetation management is planned under alternative 1. Due to overstocking and fire suppression, understory diversity has been reduced	71% of the treatments in BL-07 and 93% of the treatments in BL-08 are proposed in mid-seral, or stem exclusion, habitat that presently does not provide the structural conditions necessary for winter hare habitat. BL-07 and BL-08 – Approximately 87 percent of BL-07 and 88 percent of BL-07 and 08 would be unaffected. Treatment would maintain or increase aspen and whitebark pine, as well as promote the development of understory shrubs and increase the diversity of prey habitat across the landscape. Alternative 2 complies with VEG G1.	76% of the treatments in BL-07 and 94% of the treatments in BL-08 are proposed in mid-seral or unsuitable stand initiation habitat that presently does not provide the structural conditions necessary for winter hare habitat. BL-07 and BL-08 – Approximately 88 percent of BL-07 and 90 percent of BL-05 would be unaffected.Treatment would maintain or increase aspen and whitebark pine, as well as promote the development of understory shrubs and increase the diversity of prey habitat across the landscape. Alternative 3 complies with VEG G1.
VEG G4 – Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	No prescribed fire or fire breaks are planned under alternative 1.	BL-07 and BL-08 – While some burning to ridgelines and saddles would occur, most burning occurs on steeper slopes away from existing snowmobile trails. Also portions of all units would be unburned and establishment of woody vegetation following treatment would reduce any long-term access. Planned prescribed burning activities are not expected to create permanent travel routes or facilitate snow compacting activities. As a result, and because no fire breaks would be constructed, both alternatives comply with VEG G4.	
VEG G5 – Habitat for alternate prey species,	Suitable mature coniferous forest	Regeneration harvest and high severity	Regeneration harvest and high severity

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance	
		Alternative 2	Alternative 3
primarily red squirrel, should be provided in each LAU.	currently exists on 60 and 45% of BL-07 and BL-08, respectively.	burning would reduce suitable mature forest on 984 acres in BL-07 and on 509 acres in BL-08. Approximately 94% and 96% of the existing mature coniferous forest would be maintained in BL-07 and BL-08, respectively. BL-07 and BL-08 –Treatments would maintain or promote tree diversity and seed production and red squirrel habitat over the long term. Alternative 2 complies with VEG G5.	burning would reduce suitable mature forest on 745 acres in BL-07 and on 391 acres in BL-08. Approximately 95% and 97% of the existing mature coniferous forest would be maintained in BL-07 and BL-08, respectively. BL-07 and BL-08 –Treatments would maintain or promote tree diversity, seed production and red squirrel habitat over the long term. Alternative 3 complies with VEG G5.
VEG G10 – Fuel treatment projects within the WUI as defined by HFRA should be designed considering Standards VEG S1, VEG S2, VEG S5, and VEG S6 to promote lynx conservation.	No fuel treatments are planned under alternative 1.	BL-07 and BL-08 – See discussions for VEG S1, S2, S5 and S6 above. Treatments would reduce risks from fire and insect and disease, increase the amount and distribution of winter forage on over 5,000 acres, increase hardwood, conifer and shrub diversity and promote long-term diversity and sustainability of lynx habitat. Treatments under alternative 2 were developed considering standards to VEG S1, VEG S2, VEG S5, and VEG S6.	BL-07 and BL-08 – See discussions for VEG S1, S2, S5 and S6 above. Treatments would reduce risks from fire and insect and disease, increase the amount and distribution of winter forage on over 4,300 acres, increase hardwood, conifer and shrub diversity and promote long-term diversity and sustainability of lynx habitat. Alternative 3 was developed in part to reduce impacts to winter hare habitat. Treatments under this alternative were developed considering standards to VEG S1, VEG S2, VEG S5, and VEG S6.
VEG G11 – Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads or large piles of wind thrown trees (jack strawed piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles or residual trees to provide denning habitat in the future.	Denning habitat is currently well distributed across both LAUs, both of which contain large blocks of mature forest.	BL-07 and BL-08 – Proposed treatments are designed to retain patches of dead and dying trees which would contribute to coarse woody debris recruitment. A minimum of 5 to 20 tons per acre of downed woody debris would be retained and pdfs require retention of large diameter snags and logs. Burning would be designed to retain pockets of understory vegetation and shrubs and 20% of the site would be unburned. As a result and considering that over 83% of the existing suitable habitat would be unaffected, den habitat would continue to be widely available in both LAUs and both alternatives comply with VEG G11.	
LIVESTOCK MANAGEMENT (GRAZ): *The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat. They do not apply to linkage areas.*			

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance: Alternative 2	Post-treatment Compliance: Alternative 3
GRAZ O1 – Manage livestock grazing to be compatible with improving and maintaining lynx habitat.	Approximately 5,900 acres or 15% of the mapped lynx habitat is affected by grazing.	BL-07 and BL-08 – Existing grazing patterns would be largely unchanged. Grazing would be deferred in treatment units where aspen is regenerating and where necessary to establish vegetation. Both alternatives would increase landscape level forage, maintain riparian areas, promote shrub and understory diversity and maintain or improve aspen.	
GRAZ G1 – In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.	Approximately 5,900 acres of the project area are currently being grazed.	BL-07 and BL-08 – Livestock grazing will be maintained at existing levels unless range analysis monitoring indicates that changes in numbers are necessary. Grazing systems will be designed to be compatible with wildlife needs and if necessary improvements for livestock management will be designed in cooperation with a wildlife biologist. Both alternatives comply with GRAZ G1.	
GRAZ G2 – In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.	Aspen stands are declining due to lack of disturbance and existing regeneration is being grazed.	BL-07 and BL-08 – Grazing will be maintained at existing levels unless monitoring indicates that changes in numbers are necessary. Fencing, temporary herding, or other techniques may be used to protect regeneration and aspen where needed. Both alternatives comply with GRAZ G2.	
GRAZ G3 – In riparian areas and willow areas, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages similar to conditions that would have occurred under historic disturbance regimes.	INFISH buffer monitoring for Keep Cool Creek and Beaver Creek have been occurring since 1999 and mitigation measures have been implemented to reduce grazing impacts to riparian areas.	BL-07 and BL-08 – Livestock use is not expected to change and INFISH buffers and monitoring will continue to be implemented to reduce grazing related impacts in riparian areas. Both alternatives comply with GRAZ G3.	
GRAZ G4 – In Shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	There are three grazing allotments within the analysis area including the Stonewall and Arrastra cattle and horse allotments and the Keep Cool Liverpool sheep and goat allotment. Bunchgrass parks and shrub habitats are being invaded by conifer.	BL-07 and BL-08 – Livestock grazing will be maintained at existing levels unless range analysis monitoring indicates that changes in numbers are necessary. Grazing systems will be designed to be compatible with wildlife needs and if necessary improvements for livestock management will be designed in cooperation with a wildlife biologist. Both alternatives are in compliance with GRAZ G4 and LINK G2.	
Human Use Projects (HU): *The following objectives, standards, and guidelines apply to human use projects, such as special uses (other than grazing), recreation management, roads, highways, and mineral and energy development, in lynx habitat in lynx analysis units (LAUs) in occupied habitat, subject to valid existing rights. They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.*			

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance	
		Alternative 2	Alternative 3
HU O1 – Maintain the lynx's natural competitive advantage over other predators in deep snow by discouraging the expansion of snow compacting activities in lynx habitat.	Existing snow compacting activities are primarily associated with roads and designated trails. Some off road use is occurring.	BL-07 and BL-08 – Roads to be built will be closed to public access during project activities, and obliterated following timber removal. While some increased winter motorized use is likely within low-elevation treatment units, this would be short term due to encroachment of woody vegetation. Snowmobile use of burned areas is not expected to increase due to standing dead tree component. Future use is expected to occur largely on designated trails and there are no expected long-term increases in snow compacting activities. Both alternatives comply with HU O1.	
HU O2 – Mange recreational activities to maintain lynx habitat and connectivity	Existing recreational use is concentrated on designated trails. Some winter recreation use of suitable habitat occurs at scattered locations.	BL-07 and BL-08 – Recreational use would not significantly change or adversely affect lynx habitat and connectivity. Both alternatives comply with HU O2.	
HU O5 – Manage human activities – such as exploring and developing minerals and oil and gas, placing utility corridors and permitting special uses – to reduce impacts on lynx and lynx habitat.	All activities of this type are controlled through special use permits.	BL-07 and BL-08 – These activities are not expected to increase and would continue to be controlled through special use permits. Both alternatives comply with HU O5.	
HU O6 – Reduce adverse highway effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity and to reduce the potential of lynx mortality.	The Helena NF is involved with these interagency relationships	BL-07 and BL-08 – The Helena NF would continue to be involved in interagency relationships to provide for lynx movement and reduce potential lynx mortality. Both alternatives comply with HU O6.	
HU G6 – Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	BL-07 and BL-08 – No unpaved roads would be upgraded to maintenance levels 4 or 5 and all alternatives comply with HU G6.		
HU G7 – New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forest stringers.	BL-08 and BL-08 – There are no permanent roads proposed and all alternatives comply with HU G7.		
HU G8 - Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.	BL-07 and BL-08 – Cutting of brush along roads would be done at levels necessary to maintain public safety and all alternatives comply with HU G8.		

Criteria	Pre-treatment Compliance (Alternative 1)	Post-treatment Compliance: Alternative 2	Post-treatment Compliance: Alternative 3
HU G9 – On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in the road designs. When the project is over these roads should be reclaimed or decommissioned, if not needed for other management objectives.	No roads would be built under alternative 1.	BL-07 – 2.6 miles of roads would be built then obliterated immediately following timber removal. All roads would be closed to public access and permanently closed and restored following project implementation. BL-08 – no roads would be built. BL-07 and BL-08 – alternative 2 is in compliance with HU G9.	BL-07 – 0.4 miles of roads would be built then obliterated immediately following timber removal. All roads would be closed to public access and permanently closed and restored following project implementation. BL-08 – no road would be built. BL-07 and BL-08 – alternative 3 is in compliance with HU G9.
LINKAGE AREAS (LINK): *The following objective, standard, and guidelines apply to all projects within linkage areas in occupied habitat, subject to valid existing rights*			
LINK O1 – In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservations plans, land exchanges or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.	The Helena NF is currently involved in these types of activities and exchanges	BL-07 and BL-08 – The Helena NF would continue to be involved with landowners to reduce potential impacts to lynx and both alternatives comply with LINK O1	
LINK G2 – Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	There are three grazing allotments within the analysis area including the Stonewall and Arrastra cattle and horse allotments and the Keep Cool Liverpool sheep and goat allotment. Bunchgrass parks and shrub habitats are being invaded by conifer.	BL-07 and BL-08 – Livestock grazing would be maintained at existing levels unless range analysis monitoring indicates that changes in numbers are necessary. Grazing systems would be designed to be compatible with wildlife needs and if necessary improvements for livestock management would be designed in cooperation with a wildlife biologist. Both alternatives are in compliance with LINK G2.	

Cumulative Effects

As described under alternative 1, the cumulative effect analysis area for lynx includes the combined LAUs (BL-07 and 08) which totals 54,211 acres. There are a number of past and ongoing activities occurring within the analysis area that cumulatively affect lynx and lynx habitat. Effects of these activities are discussed under alternative 1; Table 102 summarizes anticipated cumulative effects under each of the alternatives evaluated. A complete list of all activities considered when analyzing cumulative effects to lynx can be found in appendix C.

Table 102. Action alternative cumulative effects summary

Activity	Alternative 1-Acres			Alternative 2-Acres			Alternative 3-Acres		
	Mapped Habitat[2]	Winter Forage[2]	Denning Habitat[2]	Mapped Habitat[2]	Winter Forage[2]	Denning Habitat[2]	Mapped Habitat[2]	Winter Forage[2]	Denning Habitat[2]
Campground maintenance	5	5	5	5	5	5	5	5	5
Prescribed Fire[1,]	129	86	122	3,502	249	3488	2,638	136	2,629
Grazing	5,912	2,250	4,552	5,912	2,250	4,552	5,912	2,250	4,552
Off-road NNIS treatment	1,358	636	1,255	1,358	636	1,255	1,358	636	1,255
Road Treatments	1,545	539	1,342	1,545	539	1,342	1,545	539	1,342
Stream Restoration	3	1	3	3	1	3	3	1	3
Trail Construction	196	93	159	196	93	159	196	93	159
Partial Timber Harvest[2]	0	0	0	1,800	936	1,771	1,153	507	1,136
Regeneration Harvest	0	0	0	701	128	694	582	111	575
Total Acres	**9,148**	**3,610**	**7,438**	**15,022**	**4,837**	**13,269**	**13,392**	**4,278**	**11,656**
Percent of Total Habitat	31	26	25	38	35	44	34	31	38

1 – includes burn only to avoid duplication of acres
2 – habitat affected

Effects associated with winter recreation are identical to those discussed above under alternative 1.There are no long-term negative effects to lynx or lynx habitat anticipated from other recreation activities. As previously discussed, lynx habitat would also be largely unchanged due to campground maintenance, trail construction, stream work or NNIS treatments. Considering that lynx are also generally tolerant of human activities (Ruediger et al. 2000), effects from these activities would occur largely as short-term displacement of lynx (avoidance of the area during treatments). Similarly because roadside areas are not preferred for denning, and the expected results of hazard tree removal and firewood collection would not alter foraging habitat, the effects from these activities would also consist largely of avoidance during activities.

Lands affected by current livestock grazing regimes include approximately 5,900 acres of lynx habitat and this existing use is not expected to change. Proposed Stonewall Vegetation Management Project activities would result in increased understory vegetation across the analysis area, and in the short term, grazing would be deferred where necessary in areas where aspen is regenerating in accordance with NRLMD guidelines (GRAZ G2). As a result, and considering that there is no evidence that grazing is a factor threatening lynx (USDI Fish and Wildlife Service 2007b), there are no long-term adverse or cumulative effects to lynx or lynx habitat anticipated from continuation of current grazing programs.

Lynx habitat conditions are dynamic, with habitat suitability changing as stands develop from the early stand initiation stage toward mature and multi-storied stages. The analysis of management action effects on lynx habitat is generally focused on activities that will, at least in the short term, reduce the availability of foraging habitat, because maintenance of sufficient foraging habitat is considered essential to the maintenance and recovery of lynx populations. As described above under indirect effects, the low intensity burning planned for the Stonewall Project would result in some short-term effects to lynx habitat conditions, whereas longer-term effects (greater than 10 years), including an increase in unsuitable stand initiation habitat, would result from proposed regeneration harvests, precommercial harvest, precommercial thinning within existing SI habitat, and openings created by mixed severity burning. These proposed treatments would reduce winter forage and den habitat by up to 1,200 acres (9 percent of the existing amount). Although both action alternatives will reduce the amount and quality of existing winter forage in the short term, over 90 percent of the existing winter foraging habitat will be maintained, and current unsuitable stand initiation sites will continue their development toward suitable winter foraging areas. There are no expected shortages in lynx foraging habitat as a result of project activities as the availability of sufficient winter snowshoe hare habitat will be maintained over the short term, and actually increase over time.

Both action alternatives will also reduce the amount and quality of existing lynx denning habitat (by up to 5,800 acres (20 percent)). However, over 80 percent of the existing denning habitat will be retained and suitable denning habitat would likely be restored within 10 years on many treatment sites. Because denning habitat is widely available across the landscape and not considered limiting to lynx reproduction, there are no adverse or cumulative effects to this habitat component expected under either action alternative.

As discussed under alternative 1, the lynx cumulative effects analysis area contains 675 acres of private lands. Because these lands occur at lower elevations or as scattered parcels in fragmented portions of the analysis area, they provide less lynx habitat and it is not expected that future activities on private land would further reduce suitable lynx habitat conditions or create barriers to lynx movements in this landscape.

Both action alternatives provide for continued lynx movement and dispersal throughout the analysis area. Although some treatments, such as larger regeneration harvests or improvement cuts can be expected to have longer lasting effects to some localized lynx movements (Squires et al. 2010, Squires et al. 2013), post-treatment conditions will still provide for lynx movement within the project area, throughout the larger cumulative effects analysis area, and beyond. Implementation of the Blackfoot Travel Plans over the next several years is expected to address many wildlife issues, including the potential impacts of vehicle use on lynx movements and habitat use. Although lynx do not appear to avoid forest roads or groomed snowmobile routes (Squires et al. 2010) and there are no long-term adverse impacts to lynx from roads or winter recreation anticipated, implementation of the travel plans is expected to reduce the existing level of displacement and disturbance caused by vehicle use. Direct changes to lynx habitat as a result of these travel plans are expected to be minimal.

With respect to climate change and current climate trajectories, which will not be affected by any project activities, it is reasonable to expect that upper elevations within the analysis area would likely become more important due to possible climate changes. Both action alternatives are expected to reduce the risk and impact of future wildfires, and ultimately improve the amount, diversity and distribution of winter forage habitat at upper elevations, improving the likelihood that lynx and hare habitat would continue to be available in the future.

The NRLMD was developed to provide a framework that avoids or reduces the potential for projects to adversely affect lynx and promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations. Because both action alternatives are consistent with NRLMD objectives and direction, there are no cumulative effects anticipated from implementation of either action alternative that would adversely affect the recovery of lynx populations

Irreversible or Irretrievable Commitments

There are no irreversible commitments to lynx or lynx habitat under either alternative. While there would be a temporary reduction in suitable lynx habitat or habitat quality on sites treated, suitable denning habitat would continue to be available within the project area. Sufficient foraging habitat would be maintained or improved in the long term, and no barriers to lynx movements within and across the broader landscape would be created. There are no irretrievable commitments anticipated.

Alternative 2 Determination and Conclusions

- Alternative 2 would reduce existing winter hare and denning habitat, and some increased snowmobile use is likely. However, these, although effects would be short term and are within the allowable exemptions outlined in the NRLMD. A total of 432 acres of SI habitat would be precommercially thinned, and 717 acres of multi-storied habitat would be treated as part of WUI exceptions for NRLMD standards VEG 05 and VEG 06. All proposed treatments comply with Northern Rocky Mountain Lynx Management Direction (USDA Forest Service 2007b), and there are no effects anticipated that were not considered in the BO (USDI Fish and Wildlife Service 2007b). As a result, the determination for implementation of alternative 2 is **“may affect, likely to adversely affect”** for Canada lynx.

Based on the above analysis and the following rationale, alternative 2 is expected to promote the long-term sustainability of lynx habitat.

- 80 percent of the mapped lynx habitat within the combined LAU's would be unaffected by proposed treatments.
- 91 percent of existing winter foraging and 83 percent of the potential denning habitat within the combined LAU's would be unaffected by proposed treatments.
- All roads would be closed to public access during and post implementation, and no increased development is anticipated. There would be no long-term changes in winter snowmobile use.
- Proposed treatments are designed to restore naturally occurring fire regimes and associated vegetation communities. Natural fire regimes would be restored on 3,373 acres.
- Regeneration treatments focus on stands that have MPB mortality and will promote conifer regeneration and stand diversity. Collectively treatments are expected to reduce risks from insects and disease, and reduce the likelihood of stand-replacing wildfire.
- Treatment would promote development of aspen, and increase shrub, conifer and understory diversity within treatment sites and across the landscape.

- Over the long term, treatments would result in greater stand and landscape diversity, including both spatial and temporal improvement in winter foraging habitat. Potential denning habitat would be maintained across the landscape during implementation and over the long term.
- All roads would be closed to public access during and post implementation and no increased development is anticipated.
- Collectively, treatments would promote the long-term sustainability of lynx habitat

Alternative 3 Determination and Conclusions

Alternative 3 would reduce winter hare and den habitat, but at a reduced level from that of alternative 2. Some increased snowmobile use is likely, although effects would be short- term. A total of 204 acres of SI habitat would be precommercially thinned and 435 acres of multi-storied habitat would be treated. All treatments fall within a WUI and utilize allowable WUI exceptions for VEG 05 and VEG 06. All proposed treatments comply with Northern Rocky Mountain Lynx Management Direction (USDA Forest Service 2007b). As a result, the determination for implementation of alternative 3 is "may affect, likely to adversely affect" for Canada lynx.

Based on the above analysis and the following rationale, alternative 3 is expected to promote the long-term sustainability of lynx habitat.

- 86 percent of the mapped lynx habitat within the combined LAU's would be unaffected by proposed treatments.
- 95 percent of the winter foraging habitat and 88 percent of the potential den habitat within the combined LAU's would be unaffected by proposed treatments.
- All roads would be closed to public access during and post implementation and no increased development is anticipated.
- Proposed treatments are designed to restore naturally occurring fire regimes and associated vegetation communities. Natural fire regimes would be restored on 2,498 acres.
- Regeneration treatments focus on stands that have MPB mortality and will promote conifer regeneration and stand diversity. Collectively treatments are expected to reduce risks from insects and disease, and reduce the likelihood of stand-replacing wildfire.
- Treatment would promote development of aspen, and increase shrub, conifer and understory diversity within treatment sites and across the landscape.
- Over the long term, treatments would result in greater stand and landscape diversity, including both spatial and temporal improvement in winter foraging habitat. Potential den habitat would be maintained across the landscape during implementation, and over the long term.
- Collectively, treatments would promote the long-term sustainability of lynx habitat.

Critical Habitat

Critical habitat contributes to individual species' conservation by focusing on the species' primary constituent elements (PCEs). Within the Northern Rocky Mountains, the primary constituent elements for lynx critical habitat include a boreal forest landscape supporting different successional forest stages, snow conditions that support lynx and hare, and abundant downed wood (USDI Fish and Wildlife Service 2009a). Effects to critical habitat are evaluated by looking at effects to, or changes in, these PCEs within the Stonewall Project area, which are summarized in table 103.

Table 103. Effects to primary constituent elements for designated lynx critical habitat

PCE	Effect
PCE (1): Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:	Effect of Stonewall Vegetation Management Project Action Alternatives
(a) Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface	Ninety to 95 percent of the existing winter hare habitat would be maintained. Winter hare habitat would continue to be available within all watersheds and across both affected LAU's. Over 80 percent of the treatments occur in stands that currently lack a developing understory and treatments would promote hardwood, shrub and conifer diversity. Over the long-term the amount and distribution of winter hare habitat would be improved under both action alternatives.
(b) Winter snow conditions that are generally deep and fluffy for extended periods of time	The project is not expected to alter regional snowfall regimes. With respect to snow compaction from project activities or other human disturbances, most of the anticipated recreational snowmobile use is expected to continue to occur on designated trails that are groomed and currently do not provide winter hare habitat. Re-growth of woody vegetation following harvest, interspersion of unaffected lands and the remote nature of prescribed burning sites reduce the likelihood of additional cross country snowmobile use in the project area that would affect snow conditions for lynx. Ninety to 95 percent of the current winter hare habitat would be unaffected and both action alternatives would maintain the deep, fluffy snow conditions required by hare and lynx over the short and long term.
(c) Sites for denning that have abundant coarse woody debris, such as downed trees and root wads	While treatments would reduce downed woody debris within harvest and burning sites, sufficient large-diameter logs and between 5 and 20 tons per acre of down wood will be retained on all sites proposed for harvest. Unaffected denning habitat would be retained in all sites proposed for prescribed burning and the proposed mixed severity burning would reduce finer fuels, but ultimately increase large coarse woody debris after implementation. Due to the overstocked conditions and continued mountain pine beetle mortality, snags, downed wood, and suitable denning habitat would continue to be widely available across the landscape.
(d) Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.	Boreal forest predominates across project area LAU's and when combined with matrix habitat is well distributed and interconnected. While lynx movements would be altered by treatment, connectivity within and between LAU's and documented dispersal corridors (Squires et al 2013) would be maintained under both action alternatives.

Critical Habitat Determination

With no project activities, Alternative 1 is expected to have no effect on Canada lynx critical habitat. Based on the above analysis and the following rationale, a **May Affect, Likely to Adversely Affect Critical Habitat** determination is made for both alternatives 2 and 3.

- Eighty-five percent or more of the mapped lynx habitat would be unaffected.
- Ninety-one percent or more the existing winter foraging would be unaffected and winter hare habitat would be maintained in the short term and improved over the long term. Suitable denning habitat would continue to be widely available across the landscape.
- The risk of continued reduction in winter forage and denning habitat from high-intensity wildfire would be reduced.
- PCE 1d (matrix habitat) would still support the ability of lynx to travel within their home range.
- The Fish and Wildlife Service determined (USDI 2013) that new information made available since 2007 (USDA Forest Service 2013), is consistent with information considered for the NRLMD's 2007 Biological Opinion and thus reinitiation of consultation on the NRLMD is not required for Canada lynx critical habitat (USDI Fish and Wildlife Service 2009).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Existing lynx habitat and its current trajectory would be largely unchanged under alternative 1. Under the action alternatives suitable denning habitat would continue to be abundant and well distributed across project area LAUs. Winter snowshoe hare habitat would continue to be available in the short and long term and treatments would reduce impacts from insect and disease and the likelihood of stand-replacing wildfire. All alternatives would comply with the NRLMD and are consistent with the Helena National Forest Plan, as amended (USDA Forest Service 2007b), National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26). Endangered Species Act requirements to conserve endangered and threatened species and to ensure that actions authorized, funded, or carried out are not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of their critical habitat.

Grizzly Bear

The following issue indicators are used to evaluate effects to grizzly bear:

- Compliance with Forest Plan standards and guidelines
- Amendment 19 compliance and changes in TMRD, OMRD and Security Core within the Arrastra Creek and Red Mountain subunits
- Effects to denning bears and den habitat
- Effects to bears outside the denning period and changes in cover and forage.

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct effects to bears, nor would there be changes in TMRD, OMRD or CORE habitat. Risk of wildfire would remain high, therefore the likelihood of long-term degradation or loss of grizzly bear habitat from stand-replacing wildfire is greatest under this alternative. Also as described under biophysical setting, due to continued fire suppression and insects and disease, whitebark pine is anticipated to continue to decline under this alternative.

Cumulative Effects

There is no way to predict the likelihood of a stand replacing fire and there are no direct or indirect effects under alternative 1, consequently, there are no cumulative effects anticipated for grizzly bear.

Irreversible or Irretrievable Commitments

There are no irreversible commitments to grizzly. Due to continued fire suppression, white bark pine will likely continue to decline and risks of catastrophic wildfire would remain high. Based on available information, the continued reduction in whitebark pine that would occur under this alternative may be considered an irretrievable commitment.

Alternative 1 Determination and Conclusions

The risk of stand-replacing wildfire remains high, but no direct effects are anticipated and in the absence of wildfire grizzly habitat would be unchanged. Because whitebark pine will likely continue to decline, implementation of alternative 1 **may affect but is not likely to adversely affect** grizzly bear.

Action Alternatives

Action alternatives are evaluated by key elements of grizzly bear habitat including roads/access, den habitat, cover/forage and food storage. Table 104 displays treatments within the recovery area by sub-unit, whereas changes in grizzly bear habitat resulting from the proposed treatments are displayed in table 106.

Table 104. Grizzly habitat treated[1]

Treatments	Core Habitat Treated				Den Habitat Treated				Total Treatment Acres			
	Arrastra Mountain		Red Mountain		Arrastra Mountain		Red Mountain		Arrastra Mountain		Red Mountain	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
Intermediate Harvest	0	0	0	0	0	0	0	0	1,935	1,191	197	197
Regeneration Harvest	0	0	0	0	16	2	0	0	860	612	108	108
Total Harvest[1]	**0**	**0**	**0**	**0**	**16**	**2**	**0**	**0**	**2,795**	**1,803**	**305**	**305**
Underburn	0	0	0	0		0	0	0		302	0	0
Low-Severity Fire	124	2	0	0	43	18	0	0	303	180	0	0
Mixed-Severity Fire <30 acres	1,684	411	1,110	0	442	456	59	27	2,428	1,695	1,352	373
Mixed Severity 30-75 acres	178	603	178	603	8	8	428	428	199	199	1,034	1,034
Jackpot Burning	0		0	78	0		0		0	0	0	326
Total Burning[1]	**1,986**	**1,014**	**1,288**	**603**	**493**	**482**	**487**	**455**	**2,930**	**2,376**	**2,386**	**1,734**

1 - Acres for the Arrastra subunit include 314 acres that fall outside the designated recovery zone boundary.

Both action alternatives propose a total of 81 acres of prescribed fire in Management Situation 1 lands, whereas all other treatments are in Situation 2 lands.

Direct and Indirect Effects

Disturbance

It is anticipated timber harvest and burning within harvest units would be completed in the next 5 years, whereas it may take up to 10 years to complete the proposed prescribed burn-only treatments. Because all treatments increase human activity, it is expected some bears would be displaced during the non-denning period while treatments are implemented. Although road access would be unchanged following project completion, some long-term disturbance may occur on sites where harvest creates conditions that facilitate foot access. However, within the 24,000-acre project area, harvest is proposed on 12 percent of the project area under alternative 2, and 9 percent of the project area under alternative 3. Of those acres proposed for harvest, 80 percent occur close to roads and private land where bear use is typically lower, reducing the likelihood that a bear would be affected. Also untreated habitat to accommodate any displaced bears is widely available within both subunits. For the Arrastra subunit harvest acres represent approximately 3 percent and 2 percent of the subunit under alternatives 2 and 3 respectively. For the Red Mountain subunit harvest acres represent less than 0.5 percent of the subunit under either alternative. As a result disturbance related effects would be largely limited to short-term avoidance of the sites during treatment

Roads

Alternatives 2 and 3

A total of 2.6 miles and 0.4 mile of roads would be built then obliterated immediately following timber removal under alternatives 2 and 3 respectively. Under both action alternatives, all roads that would be built and obliterated following harvest activities occur within the Arrastra subunit. No new road construction would occur in the Red Mountain subunit. These roads would be closed to public access during implementation and permanently closed and obliterated following harvest. Road maintenance would be completed to meet best management practices (BMP) on approximately 46 or 44 miles of roads under alternatives 2 and 3, respectively. The majority of road work would occur in the summer or fall therefore during project implementation all of these roads are analyzed as open during the non-denning period relative to access management. Upon completion of the Stonewall Vegetation project access management would revert back to the existing condition or reflect access management as defined by the final decision and FEIS of the pending Blackfoot Non-Winter Travel Plan anticipated to be completed in 2015.

Road Density Forest Plan Standard

The Forest Plan standard for open road densities in occupied grizzly habitat is: “In occupied grizzly habitat, to minimize man-caused mortality the open road density will not exceed the 1980 density of 0.55 miles per square mile, which was determined to have little effect on habitat capability.” Under the existing condition the open road density in occupied habitat as defined by the Forest Plan is 0.46 miles per square mile, meeting the Forest Plan standard. For alternatives 2 and 3 there would be a slight increase in open road densities during implementation due to the use of some currently closed roads and roads constructed then obliterated after implementation. As shown below, this would result in open road densities of 0.49 miles per square mile for alternative 2 and 0.48 miles per square mile for alternative 3. Therefore, the Forest Plan Standard would continue to be met for both alternatives 2 and 3 during project implementation. Since this project would not change access management post-implementation, the open road density would revert back to the existing condition of 0.46 miles/square mile upon project completion.

Table 105. Forest Plan Occupied Habitat Open Route Densities by Alternative

FP Standard = < 0.55 mi/mi2 - Occupied habitat = 297 mi2			
Alternative	**Miles of Open Route**	**Change in Open Route Miles from Existing**	**Open Route Density (mi/mi2)**
Alternative 1	135.4	N/A	0.46
Alternative 2	145.0	+ 9.6	0.49
Alternative 3	142.9	+ 7.1	0.48

NCDE Access Management - The NCDE grizzly bear recovery zone access management protocol incorporates a moving windows process to determine motorized access during the non-denning period for BMU subunits within the recovery zone. The results of the moving windows process are reflected as percentages for: open motorized route density (OMRD), total route density (TMRD), and secure core (CORE) within the respective subunits. The target thresholds identified for moving windows analysis are referred to as the 19/19/68 guidelines. The goal is to manage motorized access within each subunit during the non-denning period (4/1 through 11/30) so that both OMRD and TMRD do not exceed 19 percent of the subunit and CORE comprises at least 68 percent of the subunit. For OMRD and CORE the moving windows analysis treats all routes open to motorized use equally, regardless of the duration of public motorized use for individual routes during the non-denning period. Routes used for project implementation during the non-denning period that may otherwise restrict public motorized access are also analyzed as open. The process for the moving windows analysis and how routes are categorized based on closure methods etc. are described in the Protocol Paper - North Continental Divide Ecosystem Grizzly Bear Access Management and Flathead National Forest, Amendment 19 - Moving Window Motorized Access Density Analysis & Security Core Area Analysis for Grizzly Bear (filed in the project record as USDA FNF 2008). The 19/19/68 guidelines are described in more detail in the footnotes to table 106 below.

Under the 2013 final Record of Decision (ROD) for Blackfoot Winter Travel, snowmobile use within the Helena NF portion of the recovery zone, all NFS lands north of Highway 200, is restricted after March 31 with the exception of the Copper Bowls play area and the Copper Creek Road providing access. Although there is no spatial overlap with the project area, there is overlap with the Arrastra and Red Mountain grizzly bear subunits. Under the final Winter Travel ROD, snowmobile use is allowed in the Copper bowls play area until May 31 resulting in a 2-month overlap with the recognized NCDE grizzly bear non-denning period. In essence, the OMRD, TMRD, and CORE values for the Red Mountain and Arrastra subunits are compromised due to late-season snowmobile use during the non-denning period. However, because harvest activities for the Stonewall Project, including road improvement work ,would be restricted until after spring breakup, generally late May or June in most years, and snowmobile use of the Copper Bowls is restricted after May 31,and often concludes earlier due to annual variability in snow conditions, the potential for late-season snowmobile use to overlap in time with project implementation activities is low. Therefore, the values for the Arrastra and Red Mountain subunits presented in table 106 below reflect results of the moving windows analysis both with and without late-season snowmobile use included for the three alternatives.

Table 106. Route Density and Security Core – Moving Windows Analysis

Subunit	Snowmobile use included (yes/no) y	Percent of subunit meeting 19/19/68 guidelines								
		Alt 1			Alt 2			Alt 3		
		OMRD	TMRD	CORE	OMRD	TMRD	CORE	OMRD	TMRD	CORE
Arrastra Creek	Yes	19*	21	72*	21	21	72*	20	21	72*
	No	17*	19*	74*	19*	19*	74*	19*	19*	74*
Red Mountain	Yes	26	25	56	26	25	56	26	25	56
	No	24	21	58	24	21	58	24	21	58

* Denotes those values meeting the 19/19/68 guidelines.

OMRD - Open motorized route density guideline: ≤19% of each subunit with >1.0 mile/mi2

TMRD - Total motorized route density guideline: ≤19% of each subunit with > 2.0 mile/mi2;

CORE - Core area (>2,500 contiguous acres, ≥0.3 mi. from motorized route, no roads or trails receive "high intensity use" and no motorized routes open during non-denning period) guideline: ≥68% of the subunit considered core area.

As reflected in table 106, the only change in values generated from the moving windows analysis under either action alternative, with or without late season snowmobile use, is the OMRD within the Arrastra subunit. Under both action alternatives TMRD and CORE values within the Arrastra subunit remain unchanged and for the Red Mountain subunit OMRD, TMRD, and CORE all remain unchanged. The slight increase in OMRD in the Arrastra subunit, 2 percent in alternative 2 and 1 percent in alternative 3, is consistent among alternatives under either snowmobile scenario. The increase is due to the fact that the majority of harvest units and associated haul routes occur within this subunit and all roads built and then obliterated following timber removal are within the Arrastra subunit. The low miles of road to be built then obliterated immediately following timber removal, 2.6 and 0.4 miles for alts 2 and 3 respectively, and the close proximity of existing roads to be used as haul routes serves to minimize the degree of change within the subunit. There would be a slight increase in the TMRD for the Arrastra subunit under both action alternatives due to roads built then obliterated following timber removal. However, the degree of change within the subunit is not enough to change the TMRD percentage under either alternative. CORE within both subunits would remain unchanged under either action alternative since all haul routes remain within the existing buffers for open routes.

As shown in table 106 under alternative 1 (existing condition), late season snowmobile use in the Copper Bowls increases OMRD and TMRD and decreases CORE values for both subunits. The Red Mountain subunit currently has a degraded baseline not meeting any of the 19/19/68 guidelines with or without inclusion of late season snowmobile use. However, OMRD, TMRD and CORE within this subunit remain unchanged under both action alternatives since minimal harvest activity is proposed and haul routes would be confined to existing open roads. The Arrastra subunit meets the guidelines under all three alternatives when snowmobile use is excluded. However, when late season snowmobile use is included, TMRD is exceeded by 2 percent under all three alternatives and OMRD is exceeded by 2 percent and 1 percent under alternatives 2 and 3 respectively.

Implementation of either alternatives 2 or 3 is not anticipated to have a substantive impact upon bears relative to access management. There would be no long-term changes to access management resulting from project implementation.Upon project completion access management would revert back to the existing condition pending any changes resulting from the Blackfoot Non-Winter Travel Plan. Neither action alternative would temporarily or permanently reduce the availability of CORE in either subunit and in the Red Mountain subunit OMRD and TMRD remain unchanged during implementation. During implementation there would be no measurable change to TMRD and only a slight increase in OMRD in the Arrastra subunit. The slight increase in OMRD is anticipated to be less than reflected by the moving windows analysis since harvest activities will not be ongoing throughout the entire project area at any given time. If late season snowmobile use is not included in the analysis since the area of use does not overlap the project area spatially and there is low potential for temporal overlap the Arrastra subunit would continue to meet the 19/19/68 guidelines under all three alternatives. In addition, current research has not substantiated that late season snowmobile use has had adverse impacts upon the increasing grizzly bear population within the NCDE.

Denning Habitat

Alternative 2

Acres of modeled denning habitat proposed for treatment is displayed by alternative in table 104. Treatments proposed under alternative 2 would potentially affect 996 acres of modeled denning habitat. Of this, only 16 acres occur within harvest units while 978 acres occur in prescribed burn units. In the Arrastra subunit 509 acres of denning habitat are proposed for treatment. This includes the 16 acres within harvest units and 493 acres in prescribed burn units. In the Red mountain subunit all of the 487 acres of den habitat proposed for treatment occur within prescribed burn units. Of the 996 acres of den habitat proposed for treatment only 2 acres represent high potential (north aspects) den habitat while 994 acres are potential (all other aspects). The actual amount of denning habitat affected is expected to be lower than reflected; however, since no more than 80 percent of the units are anticipated to be burned and openings are anticipated to be created on less than 25 percent of the units, some of the identified denning habitat within burn units would remain untreated and only understory removal would occur on other sites.

Under both alternatives 2 and 3, the proposed treatments would potentially affect approximately 2 percent and 3 percent of modeled denning habitat in the Arrastra and Red Mountain subunits respectively. Although proposed treatments will reduce forest cover through regeneration harvest (16 acres) and mixed severity burning (978 acres), forest cover is not a necessary component of suitable den habitat. Reduction of forest cover therefore is not anticipated to preclude treated acres from functioning as denning habitat and does not reduce the overall availability of modeled denning habitat within the project area or the respective subunits. As noted by Aune and Kassworm (1989 p. 73) in the East Front Study “grizzly bears denned in open non-forested slopes or forested slopes and seemed to select den sites based on physical characteristics such as slope, aspect, elevation and soil type rather than vegetative cover.” Similarly, Mace and Waller (1997 p.39) found in the Swan Mountains that “grizzly bears denned more often in open (40%) and open timbered (42%) habitats than in timbered habitats.” Servheen (1981p. 11) also noted that “excavated dens were located on open slopes with obvious mineral soil tailings below the entrance.” Collectively, the findings of these studies indicate den site selection is not dependent upon forest cover and that grizzly bears selected more open high elevation slopes for denning. These studies also found the majority of bears selected new den sits each year and nearly all dens were excavated with only a few exceptions that utilized natural rock features such as caves or crevices.

Alternative 3

Under alternative 3, 939 acres of denning habitat are proposed for treatment which is 57 fewer acres than for alternative 2. For this alternative, 2 acres occur with proposed harvest units and no high-potential denning habitat would be treated. The reduction in denning habitat acres is slightly lower than in alternative 2, however, the percentage of denning habitat treated by subunit remains consistent with that reflected for alternative 2 for each subunit.

Alternatives 2 and 3

No harvest or burn treatments are anticipated to occur in denning habitat during the denning period under the action alternatives; consequently, there would be no impact upon denning bears.

Food Storage and Sanitation

Alternatives 2 and 3

People working in the woods provide opportunities for grizzly bears to be attracted to food and garbage and to become food conditioned. The Lincoln Ranger District has been covered under Food Storage Special Order H-05-01 since 2005, which addresses food and garbage storage. A clause is included in all contracts that requires the contractor adhere to this order. As a result, it is unlikely that effects associated with inadequate food storage and increased risks to bear or people would occur under either action alternative.

Cover and Forage

Effects of individual treatments are discussed in the Alternative Effects section. The following is a discussion of effects to cover and forage conditions related to grizzly bear habitat. Anticipated effects are based on implementation of pdfs including riparian or INFISH buffers. Riparian buffers are described under Project Design Features (S/WS/F – 17 RHCAs) in Chapter 2 of the FEIS. As noted in the pdfs, hazard trees adjacent to harvest units may be felled due to safety concerns but would remain on site. There would be no commercial or precommercial harvest, no dead tree removal, and no landings located in riparian buffers. No fire ignition would occur within RHCAs and efforts would also be taken to prevent fire from backing into RHCAs. As a result these areas would continue to provide both cover and travel corridors that would help facilitate bear use within many of the treatments sites.

Alternatives 2 and 3

Changes in grizzly cover and foraging habitat resulting from the proposed treatments are summarized by alternative in table 107 including changes within and outside the designated recovery zone boundary. Effects to cover and forage are discussed by treatment below.

Table 107. Grizzly bear habitat changes

Treatment/Habitat Change	Arrastra Mountain		Red Mountain		Outside Recovery Area	
	Acres	%	Acres	%	Acres	%
Alternative 2						
Long-term Reduction of Forest Cover[1]	1,431	8	756	13	95	17
Timber Harvest	764	4	108	2	95	17
Burning	667	4	656	11	0	0
Reduction in Denning Habitat[1]	0	0	0	0	0	0
Reduced Cover[2]	3,509	20	1,457	25	219	40
Timber Harvest	1,832	10	197	3	102	19
Burning[3]	1,677	10	1,260	22	117	21
Increase in Forage	4,940	28	2,214	38	314	57
Remote Habitat [3,4]	2,568	15	1,221	21	0	0
Habitat Close to Human Activity[3,5]	2,372	13	993	17	314	57
Alternative 3						
Long-term Reduction of Forest Cover[1]	1,085	6	460	8	96	18

Treatment/Habitat Change	Arrastra Mountain		Red Mountain		Outside Recovery Area	
	Acres	%	Acres	%	Acres	%
Timber Harvest	612	3	108	2	96	18
Burning	473	3	352	6	0	0
Reduction in Denning Habitat[1]	0	0	0	0	0	0
Reduced Cover[2]	3,092	18	1,584	28	217	39
Timber Harvest	1,191	7	197	3	94	17
Burning[3]	1,901	11	1,387	24	123	22
Increase in Forage	4,177	24	2,044	35	313	56
Remote Habitat [3,4]	2,063	12	1,113	19	0	0
Habitat Close to Human Activity[3,5]	2,114	12	931	16	313	56

1 – loss of overhead cover due to regeneration harvest and openings created by mixed-severity burning

2 – reduction in cover due to intermediate timber harvest and low-severity burning

3 – only includes 80 percent of each burn unit

4 – includes treatment units beyond 0.25 mile from an open road

5 – includes treatment units within 0.25 mile of an open road

Timber Harvest

Alternatuve 2

Under alternative 2, proposed timber harvest would affect 16 percent of the Arrastra subunit lands within the project area boundary, and 5 percent of the Red Mountain sub-unit lands within the project area. At the subunit level, which approximates the home range of a female grizzly, timber harvest would affect 4 percent of the Arrastra subunit and 0.4 percent of the Red Mountain subunit. For the 506 acres of project area lands outside the subunits, 199 acres or 39 percent would be affected by timber harvest. Under alternative 3, the same amount of harvest would occur within the Red Mountain subunit , although proposed harvest would be reduced to 10 percent of the Arrastra sub-unit within the project area and greater than 3 percent of the entire subunit.

Grizzly bear response to logging and logged areas is mixed and complex (Zager et al. 1983, Waller and Mace 1997a). Bear use can be affected by changes in the quality and quantity of forage and cover and by changes in human use patterns. Some studies documented reduced bear use while others found no evidence that logging impacted grizzly bears (MDNRC 2010). Areas most likely to be used are those that produce crops of preferred foods (typically soft mast), and those that are relatively free from human disturbance (ibid.). As a result, treatments were evaluated in terms of changes in cover and forage, as well as their proximity to human activity (table 107).

All harvest would result in a reduction in cover on the site, with regeneration harvest, including seedtree, shelterwood, and clearcut treatments, resulting in a long-term loss of overhead forested cover. As a result, bear use of regenerated sites would be reduced and most use within the next 10 years would be expected to occur largely near edges of treatment areas or riparian buffers. Cover would also be reduced on partial or intermediate harvest units increasing sight distances, even though residual overstory cover would be maintained on sites treated. Riparian buffers would be maintained and interspersed throughout many units however, providing security cover and reducing sight distances. Intermediate harvest that includes precommercial thinning of young stands is expected to retain adequate screening cover to provide for bear security due to the low canopies of young trees. Intermediate harvest within mature stands would retain greater overhead cover for shading, however screening cover would be lower than in young stands due to the raised tree canopies and the loss of understory cover due to harvest activities and post-harvest burn treatments. Intermediate harvest treatments are anticipated to reduce the use of treated stands as daybeds or resting sites due to the reduction in cover and shading, however screening cover will continue to improve over time as understory vegetation continues to regenerate.

The amount of human activity and access also influences the likelihood a harvest site would be used by bears. While there would be no change in public access in the project area, approximately 80 percent of all timber harvest occurs within 0.25 mile of an open road, and close to private land with more concentrated human activity. Due to the proximity to open roads and private land, existing as well as future use of these areas would be expected to be lower than for sites further from roads and human activity. As a result, the benefit to grizzly in terms of increased forage would vary throughout the project area with the greatest benefit in areas farther than 0.25 mile from an open road.

Overall treatment would result in a long-term reduction in forested cover on the acreage affected (6 percent of the recovery area). Conversely available forage would increase. For example Nielson et al. (2004) found the occurrence of critical grizzly bear foods, including roots and tubers, herbaceous vegetation and ants were more common in clearcuts than the surrounding forest. Also shrubs including huckleberry and buffalo berry were found to increase, although this varied by site (Martin 1980, Zager et al. 1983).

Bear use also varies over time. Some research indicates that grizzly do not utilize harvest units until 10 years after treatment (MDNRC 2010), whereas other research found that grizzly utilized recent clearcuts (Nielson et al. 2004, Wielgus and Vernier 2003). Also intermediate-aged clearcuts (approximately 30 years of age) were selected throughout the year, whereas recent and old clearcuts were utilized largely early in the year and again between early August and denning (Nielson et al. 2004). While grasses and forbs would be expected to increase on all sites, increases in shrubs (e.g., huckleberries) were found to be greatest on moist sites with northern and easterly aspects (Martin 1980). Consequently cover and forage availability as well as bear use would vary over time and by site.

Prescribed Burning

Including all acres within designated burn areas, prescribed burning proposed under alternative 2 would affect 17 percent and 41 percent of the Arrastra Mountain and Red Mountain subunits lands within the project boundary respectively, whereas burning under alternative 3 would affect 10 and 30 percent of these subunit lands within the project area. For the entire subunit however, prescribed burning would only affect 4 percent of the Arrastra subunit and 3 percent of the Red Mountain subunit. Considering that prescribed burning would be completed over a 10-year period, and less than 80 percent of the units are anticipated to be burned, and burn intensity would vary within units resulting in pockets of overstory removal within units, the impacts to available cover and forage would be less than the reflected percentages. Mixed-severity burning, which includes some high- intensity burning, would create openings and result in a long-term loss of forest cover on 25 to 30 percent of the site. These openings would vary in size, and would be widely scattered and interspersed with riparian buffers, untreated areas and low-severity burn areas. Bear cover would be retained on all sites. As a result, bears would continue to utilize these fire-created openings for foraging following treatment. While there would be little change in overstory on areas affected by low-severity burning (50 to 55 percent of the site), understory cover would be reduced. Riparian buffers and untreated areas (at least 20 percent of the unit) would also provide intact cover interspersed throughout the burn unit.

Since the majority of the prescribed burn-only units occur within security core habitat as defined by the lack of motorized access, it is anticipated that the increase in forage due to low- and mixed-severity burning and any openings created would receive considerable use by bears within a year of burning due to the flush of succulent forbs and grasses. Burns treatments would also be spatially and temporally distributed throughout the project area minimizing the potential effects of temporary displacement of bears and ultimately resulting in better mosaic of remote high-quality forage areas interspersed with secure cover.

Proposed burning would result in a flush of herbaceous vegetation (grasses and forbs) and it is expected that spring forage would increase within a year of the burn and would be maintained at levels above current conditions well into the future (greater than 20 years). Similarly, production of shrubs such as huckleberry and buffalo berry would increase both in the short (5 years) and long term (greater than 50 years) (Martin 1980). Finally, broadcast burning and hand thinning and pile burning in areas of whitebark pine would maintain whitebark pine on over 900 acres under both action alternatives. As a result, it is expected that proposed burning would maintain security cover, while increasing the diversity and distribution of grizzly bear foraging habitat across the landscape. Like timber harvest, use of burn areas where forage is created would be greatest in more remote areas.

Landscape Considerations

Landscape conditions have been shown to influence bear use of managed forests. For example in areas where natural openings or disturbed areas (e.g. fire) were available, bears have been found to avoid clearcuts. However, where fire suppression and succession has led to little if any forest openings, grizzly have adapted to utilizing closely related anthropogenic sites such as clearcuts. Also decades of fires suppression have reduced natural variability resulting from natural disturbance such as wildfire, and resulted in conifer encroachment that has further reduced natural openings and meadows (Nielson et al. 2004). This is a consideration for the Stonewall Project area because less than 4 percent of the project area occurs in meadow/shrub habitat and within the higher elevation burn units burning would focus on restoring natural openings by burning encroaching conifers.

Proposed mixed-severity burning would help restore fire to the landscape as well as increase the availability of openings/meadows in remote areas preferred by grizzly. As a result, both alternatives are expected to create landscape-level conditions preferred by grizzly (Nielson et al. 2004, Herrero 1972) while promoting the sustainability of whitebark pine and maintaining existing core/remote habitat.

Alternative 3

In an effort to reduce short-term impacts to cover, alternative 3 reduces proposed harvest and burning. Within Arrastra Mountain sub-unit, regeneration and intermediate harvest are reduced by 31 percent and 35 percent respectively, whereas total and mixed-severity burning within this sub-unit is reduced by 19 percent and 27 percent. Although timber harvest within the Red Mountain unit is the same as that of alternative 2, total burning is reduced by 27 percent and mixed-severity burning by 52 percent. Collectively, the reduction in treatments would maintain more cover over the short term than alternative 2, although short- and long-term increases in forage would be reduced. While whitebark pine restoration would be similar and landscape diversity improved, fire risk would be somewhat higher under this alternative.

Connectivity

Under the action alternatives it is anticipated that reduction in cover will influence grizzly bear movements within the project area. It is anticipated that bears would generally avoid regeneration harvest units (i.e., clearcuts, seedtree and shelterwood treatments) for several years post-treatment due to the lack of cover, with the greatest avoidance being clearcuts. Under the no-action alternative, use of proposed clearcut units would also likely continue to decline over the next several years because these are densely stocked, even-aged, lodgepole-dominated stands with minimal understory vegetation for forage and very high levels of mortality due to mountain pine beetle. As the high volume of dead trees continues to fall over the next several years, moving through these stands will become increasingly difficult for ungulates and large carnivores. Seedtree and shelterwood treatments would retain some residual cover, however not at levels that would serve to conceal bears or provide security; therefore, it is anticipated that bears would generally avoid using these stands for several years post-treatment as well. Because these stands support a mix of Douglas-fir, ponderosa and lodgepole pine of various age classes, stocking and mortality levels are lower than that of proposed clearcut units with greater forage availability; therefore, use would be less likely to be deterred under the no-action alternative.

Concealment cover would also be notably reduced in mature forest improvement cuts due to understory removal and the resultant raised canopy height, increasing sight distance and reducing security. Research indicates bears exhibit less avoidance tendency of these types of treatments versus regeneration treatments however, most of the treated stands would also be underburned further reducing residual understory cover and forage, which may deter use by some individuals over several years. Conversely, precommercial thinning of young stands is anticipated to retain relatively high levels of concealment cover for bears to move through due to higher stocking density retention than mature stands, the low canopy cover of young trees and the abundance of shrubs in many of these stands. Many of these young, densely stocked stands currently provide abundant forage with berry producing shrubs, grasses and forbs. While treatments would reduce both cover and forage availability, with greater reductions anticipated in mechanically treated units versus hand treatments, either treatment method would retain sufficient concealment cover and forage to support continued use by bears. In addition, post-harvest burn prescriptions in precommercial treatment units include less underburning than in improvement cut treatments providing greater forage and understory cover retention. Thinning would also serve to promote additional grass, forb, and shrub regeneration in young stands.

Prescribed burn-only treatments are anticipated to have minimal effect upon habitat connectivity and the ability of bears to move upon the landscape due to the high elevation remote nature of these stands, the extended period of time over which treatments will be conducted, and the mosaic pattern of habitats that will remain post treatment. While temporary avoidance of these sites would be expected during implementation activities, bears are not anticipated to avoid use of these sites for travel or foraging post treatment. Since any burned trees would remain standing they would continue to provide concealment cover by limiting sight distance. As a result, the temporal and spatial distribution of these treatments across the project area would retain a high level of habitat connectivity with increased forage availability over both the short and long term.

The greatest impact to habitat connectivity is anticipated in the southwestern portion of the project area where treatment units are the most concentrated and the greatest connectivity with lands south of Hwy 200 currently exists. While there has been considerable past management activities on these lands current conditions provide adequate concealment cover to facilitate bear movement to the Blackfoot River corridor and adjoining habitats to the south. The upper Blackfoot Valley lands to the east are a mix of State and private ownerships surrounding the community of Lincoln with outlying residences scattered throughout the valley. The lack of contiguous forest cover, plus human activity, deter most bears from moving across the valley although the river corridor is known to facilitate bear movements up and down the valley. Conversely, lands to the west of the project area support contiguous forest cover along either side of Hwy 200 and throughout most of the Blackfoot Canyon to Hwy 141; bears are known to frequently cross back and forth through the canyon. Grizzly bear and black bear movements across Hwy 200 west of the project area have been well documented in recent years by numerous reported observations from the public, bear highway mortalities, and by radio collared grizzlies.

While proposed treatments of the Stonewall Vegetation Project are anticipated to alter bear movement patterns over the short and long term due to the loss of cover, treatments are not anticipated to preclude bears from moving between habitats within the Scapegoat Wilderness and south of Hwy 200. At a localized scale connectivity would be degraded, however extensive undisturbed habitat providing both cover and forage would be retained within and outside the project area that would continue to allow bears to move between areas of suitable habitat. While several treatment sites, particularly those close to open roads, may not support the level of cover and security preferred by grizzly and deter use, the mix of treatments and their distribution or proximity to one another, the retention of riparian buffers, reserve patches, snags and down logs, and topography and distance from open roads is anticipated to sustain varying levels of use by grizzly in other portions of the project area. As forage increases over the first few years following treatments and concealment cover increases over the next decade, bear use would be expected to continue to increase in both frequency and distribution among treatment sites.

Habitat connectivity would be degraded under either of the action alternatives; however sufficient habitat would be retained within and outside of treatment areas that at the landscape-scale connectivity would remain well established between suitable habitats throughout the recovery zone and the distribution zone. Because fewer acres would be treated under alternative 3 and more untreated habitats would be distributed among treatment units, the effects of habitat connectivity under alternative 3 would be somewhat less than those for alternative 2. Under either action alternative there would be no permanent loss of connectivity due to project activities

Cumulative Effects

As described previously, the cumulative effect boundary includes 89,216 acres. Of this 75 percent occurs on national forest, less than 1 percent is State land and 24 percent is in private ownership. The cumulative effects area does not include those portions of the Arrastra and Red Mountain subunits that occur within the Scapegoat Wilderness since there is minimal overlap in the type of uses that occur outside the wilderness.

Past, ongoing and future activities within the action area include hazard tree removal, dispersed recreation, NNIS treatment, grazing, private land development, dispersed recreational use and firewood collection, timber harvest, trail maintenance, wildfire, prescribed burning and travel management planning. A complete list of activities is summarized in volume 2, appendix C.

Potential past, ongoing and future activities that may have long-term effects upon grizzly or their habitats include grazing, private land development, wildfire, timber harvest, prescribed burning, firewood collection and hazard tree removal, motorized and non-motorized recreation, placer mining, hunting and other dispersed use. Because there is no change in public access as a result of this project, dispersed recreational use is expected to remain relatively unchanged until implementation of the Blackfoot Non-Winter Travel Plan. It is anticipated that the travel plan will serve to improve grizzly bear habitat with respect to motorized access management.

Although there may be some minor changes in the future, no substantive changes in livestock grazing are anticipated. There will continue to be forage competition between livestock and bears in the future and the presence of livestock may deter use of some habitats by bears. The potential will remain for human conflicts associated with livestock grazing, which is particularly true for sheep allotments where past conflicts have resulted in bear mortalities.

Private land development in the future is anticipated to be minimal in large part due to lack of available lands for development and the lack of employment opportunities in the area. The minimal loss of habitat resulting from new home construction or improvements to existing properties would have minimal effect on grizzlies as suitable habitat would remain readily abundant elsewhere. Attractants at human residences have the potential to lead to human/bear conflicts and in the short term, during and following project implementation, grizzlies could be displaced from treatment areas and seek food sources closer to residences increasing the potential for conflicts.

Other past, present and ongoing activities including hazard tree removal, non-native invasive weed treatment, road maintenance and personnel use firewood are anticipated to have minimal cumulative impact because of their close proximity to open roads where grizzly are less likely to occur. As a result long-term impacts from these activities are not anticipated.

Activities that could result in long-term effects to grizzly include those that would reduce cover or increase human activity, particularly into more remote habitat used by bears. This includes wildfire, timber harvest and prescribed burning. Table 108 displays past and ongoing activities as well as the maximum amount of future activities anticipated (alternative 2). The cumulative effect analysis period includes regeneration harvest where grizzly bear use may still be affected due to reduced cover conditions, as well as wildfire.

Table 108. Action area cumulative effects

Activity	Past Activities				On-going/Future Activities				Total	
	Arrastra Mountain		Red Mountain		Arrastra Mountain		Red Mountain		Arrastra Mountain	Red Mountain
	Ac	%	Ac	%	Ac	%	Ac	%	%	%
Timber Harvest	1,1391	3	1,206	2	2,596	7	305	<1	10	<1
Prescribed Burning	86	3	0	0	2,930	8	2,386	5	8	5
Wildfire	899	2	25,276	57	NA		NA		2	57
Total Area Affected	**2,038**	**5**	**25,366**	**57**	**5,797**	**15**	**2,691**	**6**	**20**	**63**

1 – includes 227 acres on state land and final harvest on National Forest

2 – all but 90 acres include salvage associated with the snow talon wildfire and the acres affected included in wildfire

3 – occurs on harvest areas and acres reflected accounted for there

Over half of the Red Mountain sub-unit has been affected by wildfire.While past timber harvest has occurred on approximately 3 percent of this sub-unit, all but 90 acres was salvage harvested following the fire. Future activities will affect approximately 5 percent of this subunit, and of this, mature forest and grizzly bear cover will be retained on 75 percent of the acreage treated. Openings created by mixed-severity fire and regeneration harvest will reduce forested habitat by approximately 2 percent of the unit. Overall during the analysis period approximately 63 percent of the Red Mountain subunit lands would have been affected, with 90 percent of the affected acreage associated with past wildfire.

Approximately 20 percent of the Arrastra sub-unit has been affected by harvest, burning or wildfire during the analysis period. Past regeneration harvest has affected approximately 3 percent and proposed treatments will affect another 7 percent. Approximately 2 percent has been affected by past wildfire, whereas prescribed burning under the proposed action will affect another 8 percent.

While past, ongoing and future activities evaluated will affect 10 percent of the action area, 89 percent of the treatments included in the proposed action will maintain forest cover and bear security habitat (intermediate harvest and acres affected by low-severity burning), while promoting stand and landscape-level forage. Although forest cover will be reduced due to proposed regeneration harvest and openings created by mixed-severity burning, as described under direct and indirect effects, 80 percent of the harvest would occur close to roads/human activity, where less bear use occurs, reducing potential impacts to bears. Also openings created by mixed severity burning are widely scattered and would be expected to promote forage conditions preferred by grizzly, including maintenance of white bark pine. The action area has recently been affected by wildfire and the proposed treatments are designed to reduce the risk of stand-replacing wildfire that could result in a greater loss of cover across a broader landscape.

The Forest issued the Blackfoot Non-Winter Travel Plan Final Environmental Impact Statement and Draft Record of Decision in March 2014. The travel plan will designate motorized and non-motorized routes for non-winter travel on the Lincoln Ranger District and addresses long-term grizzly bear access and security core habitat concerns. The Final ROD for that project is anticipated to be issued in late 2015. The Draft ROD identified alternative 4 as the preferred alternative, which would improve OMRD, TMRD, and CORE values for both the Arrastra and Red Mountain subunits. However, based on objections received to the travel plan, it is possible that the decision for the Final ROD may vary somewhat from alternative 4.

While the Stonewall project would not change access management, some changes within the project area including road decommissioning and changes in the motorized and non-motorized trail system are anticipated. Consultation with the USFWS is currently being conducted for the travel plan which addresses access management for grizzly bears. Several of the cumulative effects activities described above are not anticipated to have long-term effects on grizzly bear or its habitat (e.g., grazing and private land development, and activities occurring close to open roads including dispersed recreation, hazard tree removal, weed treatment, road maintenance, and firewood gathering). Activities that reduce forest cover or increase human activity can result in long-term effects and include wildfire, timber harvest, and prescribed burning. Although the project proposes to add to the existing effects of past activities, most of the proposed harvest acres occur close to roads and existing human activity. Openings created away from roads (i.e., mixed-severity fire openings) are anticipated to be beneficial to grizzly bear by increasing forage production and maintaining white bark pine into the future. It is not anticipated that implementation of the treatments under either alternative 2 or 3 would result in significant long-term adverse cumulative effects to the grizzly bear.

Irreversible or Irretrievable Commitments

There are no irreversible commitments to grizzly anticipated. While proposed activities would result in both short- and long-term reductions in forest cover, less in alternative 3 than alternative 2, they would also improve habitat diversity, promote whitebark pine restoration and reduce the potential impacts of stand-replacing wildfire. As a result, habitat within treated sites would have greater potential of being retained and enhanced on the landscape over the long term.

Action Alternatives Determination and Conclusions

Both alternatives 2 and 3 would improve landscape-level foraging habitat, maintain and enhance whitebark pine, but result in short- and long-term reductions in cover increasing the risk of bear/human interaction. Based on the above analysis and the following rationale, it is the determination that implementation of either alternative 2 or 3 **may affect, likely to adversely affect** grizzly bear.

- Within the Arrastra Mountain sub-unit, guidelines for total motorized road density (TMRD) and open motorized road density (OMRD) would be exceeded by 1-2 percent during project implementation if activities temporally overlap with late-season snowmobile use in the Copper Bowls play area. If project activities do not overlap temporally the OMRD and TMRD guidelines would be met for the Arrastra subunit during implementation of either action alternative. The Arrastra subunit currently meets the guideline for CORE, which would remain unchanged under either action alternative. The Red Mountain subunit currently has a degraded baseline exceeding all 19/19/68 guidelines and although there would be no further degradation of OMRD, TMRD, or CORE values under either action alternative, the determination of likely to adversely affect grizzly bears is due to the existing adverse motorized access condition and short-term increase in road use during implementation. After implementation of either action alternative access management would return to the existing condition.

- While up to 2.6 miles of roads would be built then obliterated immediately following timber removal under alternative 2, and 0.4 miles under alt 3, these segments would be closed to public access during implementation. While there would be an increase in road use for project implementation there would be no change in public motorized access during or post implementation. The FP standard not to exceed .55 mi/sq. mi. of open roads in occupied habitat would continue to be met under both action alternatives.
- All modeled den habitat will be maintained based on denning habitat features most often selected for by grizzly bears. Burning could potentially influence den site selection although there is no available science indicating canopy loss due to fire precludes use as denning habitat. For the combined subunits, approximately 71 percent of available denning habitat occurs within the wilderness and more than 97 percent of available denning habitat would remain unaffected by proposed treatments. In addition, no project activities would occur within suitable den habitat during the denning season; therefore no impacts to denning bears are anticipated.
- Eighty percent of proposed timber harvest is in close proximity to open roads and concentrated human activity, reducing the likelihood that bears would be affected. Only short-term disturbance and displacement is anticipated during implementation and no long-term adverse direct effects to bears are anticipated.
- Existing forested cover would be maintained on a minimum of 92 and 87 percent of the Arrastra and Red Mountain sub-units respectively.
- Proposed treatments would promote the long-term sustainability of whitebark pine, increase stand and landscape-level forage, and restore fire to the landscape while reducing the risk of stand-replacing wildfire and a further reduction in grizzly bear habitat.
- Timber harvest is anticipated to limit use of some treatment areas for several years, however sufficient cover would remain in many units to facilitate connectivity between suitable habitats within and outside the project area. Lands to the west of the project area would remain untreated maintaining opportunities for bears to travel between habitats on either side of Hwy 200.
- All treatments are consistent with Forest Plan goals, objectives and standards and comply with Interagency Grizzly Bear Recommendations.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Grizzly habitat would be largely unchanged under alternative 1. Action alternatives would reduce grizzly bear habitat; however, all but 81 acres would occur within Management Situation 2 lands. Numeric goals for TMRD, OMRD and core would be met post implementation, and treatments would promote the sustainability of whitebark pine, promote landscape conditions preferred by grizzly and reduce the risk of stand-replacing wildfire. As a result, all alternatives are consistent with Forest Plan direction to maintain or enhance sufficient grizzly bear habitat to meet the population goals established in the Grizzly Bear Recovery Plan for the Helena National Forest (USDA Forest Service 1986 p. II/1), and apply grizzly bear guidelines to essential and occupied habitat and to minimize man-caused mortality by not exceeding designated open road densities (USDA Forest Service 1986 p. II/19).

Sensitive and Federal Candidate Species

Wolverine

Alternative 1

Direct and Indirect Effects

Because there are no treatments proposed under this alternative, there would be no direct impacts or mortality to wolverine. In the absence of a disturbance event such as large-scale blowdown or stand-replacing wildfire, stands would continue to mature and late-successional conditions, including increasing levels of downed wood would develop. While fuel loading and the risk of wildfire would be greatest under this alternative, den and dispersal habitat would be largely unchanged. Similarly, big game forage and cover, deer and elk populations and wolverine foraging habitat would be maintained.

The existing road system would be unchanged under this alternative and human access is not expected to increase. Remote and natal denning habitat would be maintained and there would be no changes in trapping pressure or increased disturbance to denning habitat anticipated.

Cumulative Effects

Past, ongoing and anticipated future cumulative effects are discussed in volume 2, appendix C. The most far-reaching effect of past management activities has been the development of road systems, recreational trails, and sites that improved access and promoted human use in remote areas. Management activities such as timber harvest and reforestation treatments have altered vegetation and use of the area by big game, reduced overstory snow interception and further increased human access and potential disturbance. Natural disturbances such as the 2003 Snow Talon fire have affected over 23,500 acres within the analysis area, including lands suitable to wolverine reproductive needs..

Past, ongoing and future activities that are most likely to affect wolverine or its habitat during the analysis period are summarized in table 108, which includes activities within the analysis area as a whole, as well as those activities that would occur in natal denning habitat.

Table 109. Past, ongoing and future activities within the wolverine cumulative effect area

Activity	Analysis Area	Natal Denning Habitat
Hazard tree Removal	568 acres	None
NNIS treatment	4,000 acres	None
Firewood Collection	Within 100 ft. of Open Roads	None
Past Wildfire	23,000 acres	3,203 acres
Recent Wildfire	755 acres	301 acres
Trail Maintenance	446 acres (within 100 ft. of trails	35 acres (8 miles of trail)
Prescribed Fire	410 acres	210 acres

While there would be some modification of the understory and removal of downed wood, activities such as trail maintenance, firewood collection and invasive plants treatment would primarily result in short-term disturbance. There would be little habitat changes from these activities. Hazard tree removal would modify foraging habitat along open roads but but not to the point where potential wolverine use would be precluded. Trail maintenance, including trails through natal denning habitat, would continue. While trail use is not expected to change, existing levels of disturbance along the trail corridors would continue.

Also some dispersed recreation activities occur in areas with persistent snowpack. Because wolverines coexist with some level of human disturbance and habitat modification, and considering use is not expected to change, continued recreational use of the analysis area is not expected to adversely affect wolverine. Low-intensity prescribed fire would occur on approximately 400 acres and potential effects to wolverine and wolverine habitat include disturbance during treatment and a short-term reduction in understory vegetation and structure, although both natal denning and foraging habitat would be maintained following treatment.

Approximately 23 percent of the cumulative effects area has been recently (since 2003) affected by wildfire. While wildfire can create conditions preferred by big game and other prey species, fire may temporarily displace wolverines, which utilize late-successional conditions (Greater Yellowstone Coordinating Committee 1988 *in* USDA Forest Service 2012e) and generally post-fire habitat is less suitable than unburned habitats (Hayes, 1970 *in* USDA Forest Service 2012e). Generally, areas that have been recently burned are considered less suitable for wolverine than unburned habitats (Hayes, 1970 in USDA Forest Service 2012e). However post-fire conditions can improve habitat for big game (USDA Forest Service 2012e), therefore, wolverine foraging habitat conditions would be expected to recover and improve over time as a result of these fires. For example the 2011 wolverine documentation occurred on lands affected by the 2003 Snow Talon fire, indicating that foraging on these lands is occurring.

Remote lands within the analysis area and adjacent Wilderness would continue to provide abundant, high quality habitat for wolverines in the short term and long term. Climate change may continue to be an influence on wolverine populations in the long-term and may affect habitat conditions in the future but this is not currently considered a threat to the wolverine’s existence. As a result, and considering the small amount of natal denning or foraging habitat impacted by on-going/future activities, and the continued availability of remote habitat within the analysis area, wolverine habitat would be maintained in this landscape

Determination of Effects and Rationale

Although recent fires have affected wolverine foraging and denning habitat, there are no direct project effects associated with alternative 1 and abundant suitable habitat would continue to be available in the foreseeable future. While the risk of future wildlife is greatest under this alternative, there is no way to predict if or when wildfire would occur. Based on the absence of direct project effects and the following rationale, implementation of alternative 1 is expected to have no impact on wolverines.

- Human access and the availability of remote habitat would be maintained and no increase in trapping pressure is anticipated.
- Sufficient natal den habitat would be maintained.
- Big game numbers and use, and wolverine foraging habitat would be largely unchanged.
- Late-successional forest conditions would be maintained or increase with in the analysis area.
- The available scientific and commercial information does not indicate that other potential stressors such as land management, recreation, infrastructure development and transportation corridors pose a threat to the DPS (USDI Fish and Wildlife Service 2013).
- The proposed rule to list the wolverine as threatened (USDI Fish and Wildlife Service 2013) states; “Little scientific or commercial information exists regarding effects to wolverines from development or human disturbances associated with them. What little information does exist suggests that wolverines can adjust to moderate habitat modification and human disturbance. In addition, large amounts of wolverine habitat are protected from human disturbances and developments, either legally through wilderness and National Park designation, or by being

located at remote and high elevation sites. Therefore, wolverines are afforded a relatively high degree of protection from effects of human activities by the nature of their habitat".

The status of wolverine is currently under litigation and subject to change before this analysis is incorporated into a final NEPA document. Based on the above factors, if the USFWS decision (USDI Fish and Wildlife Service 2014) to not list the wolverine as a Threatened Species is overturned by the court, and the USFWS is ordered to list the wolverine as a threatened species, the determination of this analysis is that alternative 1 would have no effect on wolverines. If the wolverine were returned to Proposed status for further evaluation by the USFWS, the determination is that this alternative would have no effect on the wolverine population in the North American DPS.

Action Alternatives

Direct and Indirect Effects

Neither action alternative proposes any timber harvest in primary wolverine habitat identified by the snow persistence model (Copeland et al 2009) or the maternal habitat model (Inman et al. 2013). For both models the wolverine habitat within burn units is consistent between alternative 2 and 3. Based on the snow persistence model both alternatives propose mixed severity burning on approximately 2,250 acres of wolverine habitat whereas the maternal habitat model reflects approximately 1,010 acres within proposed burn units. While both alternatives propose mixed severity burning in primary wolverine habitat, because burning would not occur during the denning period, there are no direct effects to any potentially active wolverine dens or increased wolverine mortality anticipated as a result of any project activities..

Of the primary wolverine habitat that falls within proposed burn units in either action alternative, potential habitat changes include canopy loss, reduced understory structure and a reduction in downed woody debris. The majority of openings created by fire are expected to be less than 30 acres in size, widely scattered and interspersed with un-burned or lightly burned lands. So while it is recognized that some modeled denning habitat will be impacted, it is not possible to determine the actual extent of this impact to future wolverine denning potential without knowing very specific post-fire micro-site conditions related to opening locations, downed wood structure and availability, and more importantly, future snow conditions which will ultimately determine denning suitability on any particular acre of potential denning habitat. Under either action alternative, suitable denning habitat would continue to be maintained across the landscape.

While proposed treatments have the potential to affect dispersing or travelling wolverines through disturbance or displacement during project activities, wolverines are 20 times more likely to stay in the area of persistent snow cover during dispersal (Schwartz et al. 2009). As a result and considering that timber harvest is proposed in areas of low elevation and that burning would occur after the snow is gone, it is unlikely that dispersing animals would be directly affected by treatment activities. Rather, they are likely to be travelling on high elevation ridges east and north of treatment areas where there is persistent snow and contiguous remote habitat associated with the Scapegoat Wilderness.

Effects of proposed activities on vegetation structure and composition are discussed in detail in section 4.3 and include a reduction in mature forest on 2,221 acres under alternative 2 and 1,641 acres under alternative 3 due to regeneration harvest and openings created during mixed severity burning. Low intensity burning and intermediate harvest would reduce understory structure and downed woody debris, which would modify habitat for wolverine prey species and reduce downed wood. Habitat for species such as the red squirrel and snowshoe hare would be reduced (Ruediger 2000), whereas habitat for chipmunks and ground squirrels would increase (Woolf 2003). These changes in habitat would occur on 5,249 acres under alternative 2 and 4,472 acres under alternative 3.

In Montana and Idaho, big game carrion appears to be the major food source and large mammal carrion is an important dietary component, particularly in winter when other prey is scarce (Banci 1994, Pasitschniak and Lariviere 1995). Anticipated effects on elk and deer are described under big game. While big game use would change, considering that 90 percent of the analysis area would be unaffected, that big game security habitat would be maintained, and that the amount and quality of ungulate forage would be maintained or improved, adequate habitat would continue to be available both in the short and long term to support desired levels of elk and wolverine foraging habitat would be maintained under both action alternatives.

There would be no changes in road management or public access under either action alternative. New roads to be obliterated immediately following harvest are proposed on 2.6 miles under alternative 2 and 0.4 miles under alternative 3. Because these roads occur in areas that are already roaded, they would not further fragment intact forest or reduce landscape connectivity for wolverines, and there would be no reduction in remote forest habitat under either alternative. Harvest is proposed only at lower elevations that lack deep persistent snow, although disturbance to foraging animals during the winter months could occur.

Under the action alternatives; 64 percent or more of the analysis area would be unaffected by treatment, no effects to denning or dispersing animals are anticipated, wolverine denning, dispersal, and foraging habitat would continue to be available in the short and long term, and there would be no reduction in remote habitat. Collectively for these reasons wolverine habitat would be maintained across the landscape and the likelihood that animals would be directly affected is low.

Cumulative Effects

In addition to effects described under alternative 1, up to 3,099 acres of timber harvest and 5,463 acres of burning would occur (under alternative 2). Ongoing and future activities would affect 829 acres of modeled denning habitat and reduce mature forest on up to 2,221 acres, which could potentially alter wolverine movement and use. The likelihood that an individual wolverine would be affected is reduced when you consider that the majority of available denning habitat would remain unaffected and that harvest occurs at lower elevations that lack deep persistent snow, reducing the possibility of wolverine occurrence there. Additionally both remote lands and big game habitat would be maintained and public access and trapping pressure would be unchanged.

In the past, wolverines may have been subject to overharvest, but evidence (USDI Fish and Wildlife Service 2014) indicates that wolverine populations have been expanding in recent years and trapping is no longer considered a threat. With the currently suspension of the Montana trapping season for wolverine, existing restrictions in public motorized access, and the continued availability of secure habitat, sufficient protection for wolverine populations remains under both action alternatives. As under alternative 1, dispersed recreation would continue to occur, although this use is not expected to change and there is no evidence that activities such as hiking, camping or hunting adversely affect wolverines. Because wolverines can coexist with some level of human disturbance and habitat modification (USDI Fish and Wildlife Service 2013), continued recreational use of the analysis area is not expected to adversely affect the wolverine.

As discussed above under alternative 1, remote lands within the analysis area and adjacent Wilderness would continue to provide abundant, high quality habitat for wolverines in the short term and long term. Climate change may continue to be an influence on wolverine populations in the long-term and may affect habitat conditions in the future but this is not currently considered a threat to the wolverine's existence (USDI Fish and Wildlife Service 2014). As a result, and considering the small amount of available natal, denning, or foraging habitat actually impacted by on-going/future activities, and the continued availability of remote habitat within the analysis area, wolverine habitat would be maintained in this landscape under both action alternatives.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments to wolverine. While there would be changes in some vegetative conditions due to proposed burning and harvest, sufficient wolverine habitat will be maintained in the analysis area and the treatments do not represent a permanent loss of habitat suitability for wolverine.

Determination of Effects and Conclusions

The Stonewall project was analyzed for effects to wolverines based on vegetation changes and the distribution from human activities associated with the project. Based on the analysis provided and the following rationale, it is determined that implementation of the Stonewall Vegetation Management Project may impact individual wolverines but would not likely contribute to a trend toward Federal listing.

- Mature forest conditions would be maintained on 75 percent of the acreage treated and over 64 percent of the analysis area would be unaffected by any proposed action.
- There are no effects to wolverine denning or dispersal anticipated; no burning would occur during the denning period and burned areas are not anticipated to preclude future use for denning activities.
- There would be no increase in human access and remote habitat would be maintained. Trapping pressure would remain unchanged.
- Big game populations and wolverine foraging habitat would be maintained.
- Proposed treatments would reduce the risk of stand-replacing wildfire.
- The available scientific and commercial information does not indicate that other potential stressors such as land management, recreation, infrastructure development and transportation corridors pose a threat to the DPS (USDI Fish and Wildlife Service 2013).
- The proposed rule to list the wolverine as threatened (USDI Fish and Wildlife Service 2013) states; “Little scientific or commercial information exists regarding effects to wolverines from development or human disturbances associated with them. What little information does exist suggests that wolverines can adjust to moderate habitat modification and human disturbance. In addition, large amounts of wolverine habitat are protected from human disturbances and developments, either legally through wilderness and National Park designation, or by being located at remote and high elevation sites. Therefore, wolverines are afforded a relatively high degree of protection from effects of human activities by the nature of their habitat”.

As explained earlier, the status of wolverine is currently under litigation and subject to change before this analysis is incorporated into a final NEPA document. Based on the above factors, if the USFWS decision (USDI Fish and Wildlife Service 2014) to not list the wolverine as a Threatened Species is overturned by the court and the USFWS is ordered to list the wolverine as a threatened species, the determination of this analysis is that the action alternatives **may affect, but are not likely to adversely affect wolverines**. If the wolverine were returned to Proposed status for further evaluation by the USFWS, the determination is that the action alternatives would **not jeopardize** the wolverine population in the North American DPS

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Wolverine habitat would be largely unchanged under alternative 1. While there would be some changes to vegetative conditions with modeled denning habitat under the action alternatives, no effects to wolverine denning or dispersal activities are anticipated, and suitable denning, foraging and dispersal habitat would continue to be available in the analysis area. Landscape connectivity and remote habitat conditions would be maintained under all alternatives. Consequently all alternatives are consistent with Forest Plan (USDA Forest Service 1986) direction to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17); to maintain and improve wildlife habitat over time; to support big game and other wildlife species (p. II/1); provide habitat for small game, furbearers and other wildlife species (p. II/4); and to develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs (p. II/2). All alternatives are also consistent with National Forest Management Act requirements to provide for a diversity of animal communities (36 CFR 219.26).

Gray Wolf

To ensure the conservation of wolf populations, the Forest Service uses three limiting factors identified in the Gray Wolf Recovery Plan (USDI Fish and Wildlife Service 1987) to evaluate impacts from forest management including; (1) potential for wolf/human interaction, (2) effects on the wolf prey base, and (3) impacts to the integrity of key wolf habitat (i.e., rendezvous and den sites). The following is a discussion of these factors by alternative.

Alternative 1

Direct and Indirect Effects

There are no treatments proposed for this alternative, so there are no direct effects anticipated to the gray wolf. Landscape-level habitat is displayed in table 70 and alternative treatment effects discussed in the Alternative Effects section. As described, there would be little change in forest structure and diversity under alternative 1, although increased levels of DWD would occur. Mature forest conditions would continue to predominate across the project area. While forage for big game may continue to decline in some areas, it is expected that localized increases in big game forage would occur and cover would continue to be available within all drainages. There are no anticipated increases in human activity or access, and livestock grazing would be unchanged.

Cumulative Effects

Past, ongoing and anticipated future cumulative effects are in volume 2, appendix C. Anticipated effects are summarized in table 90 and include hazard tree removal, NNIS treatment, road and trail maintenance, trail reconstruction, campground use and improvement, firewood collection, livestock grazing, wildfire, off-forest harvest, ongoing dispersed use and approved prescribed burning.

As described in the Cumulative Effects for All Alternatives section, very little change in existing uses, including livestock grazing and dispersed recreational use, are expected. Also much of this activity would continue to occur along roads or in areas that already receive more concentrated human use (e.g., trails and campground) where wolves are less likely to occur. Wildfire, hazard tree removal, timber harvest and prescribed burning may result in long-term changes in wolf cover and forage conditions and cumulatively, approximately 1,500 acres (2 percent) of the analysis area. While there may be localized changes in big game use, deer and elk habitat would be largely unchanged, public access would not increase, there are no effects to den or rendezvous sites anticipated and habitat conditions necessary to support local populations of wolves would be maintained.

Irreversible or Irretrievable Commitments

Habitat for wolves would remain largely unchanged under this alternative and there are no irreversible or irretrievable commitments to wolves.

Determination and Conclusions

Suitable wolf habitat, including remote areas for denning and big game populations would remain largely unchanged. As a result, and considering that human use and access is not expected to increase, implementation of alternative 1 would have **No Impact** on wolves.

Action Alternatives

Direct and Indirect Effects

While wolves are in the area, there are no known wolf den or rendezvous sites affected and there is no mortality anticipated. While both action alternatives would result in some increase in human activity during implementation, effects would be short term and unaffected habitat is available to support any temporarily displaced animals. The likelihood that an animal would be affected is reduced when you consider that all roads to be built then obliterated immediately following timber removal occur in areas that are already roaded, that approximately 80 percent of the harvest is close to an open road, which is less likely to be used and that public access would be unchanged. .

Based on the treatment effects discussion in the Alternative 1-No Action section and the analysis presented under deer and elk, habitat for big game species would be maintained in the short term and long term. As a result, and due to the widespread availability of unaffected habitat, big game populations and wolf foraging habitat would be maintained.

Cumulative Effects

In addition to effects described under alternative 1, up to 3,099 acres of timber harvest and 5,463 acres of burning would occur (under alternative 2). Specific activities and their effects to wildlife habitat are discussed in the Cumulative Effects for All Alternatives section and under the Direct and Indirect Effects section above. While some activities would result in little change in habitat, treatments would reduce mature forest, alter big game use and increase human access during treatment, whereas approximately 70 percent of the analysis area would be unaffected by treatment, While there may be localized changes in big game use, deer and elk habitat would be maintained, public access would not increase, there are no effects to den or rendezvous sites anticipated and habitat conditions necessary to support local populations of wolves would be maintained.

Irreversible or Irretrievable Commitments

While there would be a short-term decrease in cover, this would be restored and foraging habitat would be maintained or improved. There are no irreversible or irretrievable commitments to wolves.

Action Alternative Determination and Conclusions

Alternatives 2 and 3 have potential for short-term disturbance to foraging or dispersing wolves and would modify big game use. However, based on the above analysis and the following rationale, implementation of alternatives 2 and 3 **may impact individuals, but are not likely to cause a trend toward federal listing** for the gray wolf.

- No den or rendezvous sites would be affected by treatment.
- Any increases in human activity would be short term and unaffected foraging habitat is available within all drainages.
- There are no anticipated increases in livestock use and any increased human activity would be associated primarily with existing trails and use areas.

- Big game habitat and populations are expected to be maintained over the short term and long term.
- Treatments would reduce the risk of stand-replacing wildfire.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

There are no den or rendezvous sites affected under any alternative. Foraging habitat would be largely unchanged under alternative 1. While the action alternatives would affect suitable foraging habitat, big game populations would be maintained or improved. Long-term human access would not be increased and remote habitat would be maintained; no new system roads would be constructed and all roads built would be obliterated immediately following timber removal and would be closed to public access during implementation. Risks of large-scale wildfire would be reduced. All alternatives comply with Forest Plan direction to maintain or improve wildlife habitat over time to support big game and other wildlife species and to maintain or enhance gray wolf habitat to facilitate recovery (USDA Forest Service 1986 p. II/1) and to develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs (p. II/2). All alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Fisher

Alternative 1

Direct and Indirect Effects

There would be no change in roads, road use, public access or risk of trapping mortality. However habitat would change, depending on future disturbances. In the absence of wildfire, while some mortality will occur, fisher habitat in the eastern third of the project area would remain largely intact. Also connectivity with suitable habitat in the Stonewall and Liverpool drainages would be maintained with habitat east of the project area in the Keep Cool drainage (see figure 83). Due to the predominance of lodgepole in the Lincoln Gulch and Beaver Creek drainages and continued MPB mortality, fisher habitat, including connectivity in these drainages would likely be reduced for the next five to 10 years. Levels of DWD would remain high, which would promote preferred structural conditions on lands that maintain adequate canopy closure.

Elevated fuel conditions and continued MPB mortality would increase the risk of stand replacing fire, similar to the 2003 Snow Talon fire, that reduced mature forest on over 20,000 acres in the Copper Creek drainage. If that occurs there would be a long-term reduction in fisher habitat. While there is no way to predict if a wildfire will occur, the risk of a large high intensity wildfire is greatest under this alternative.

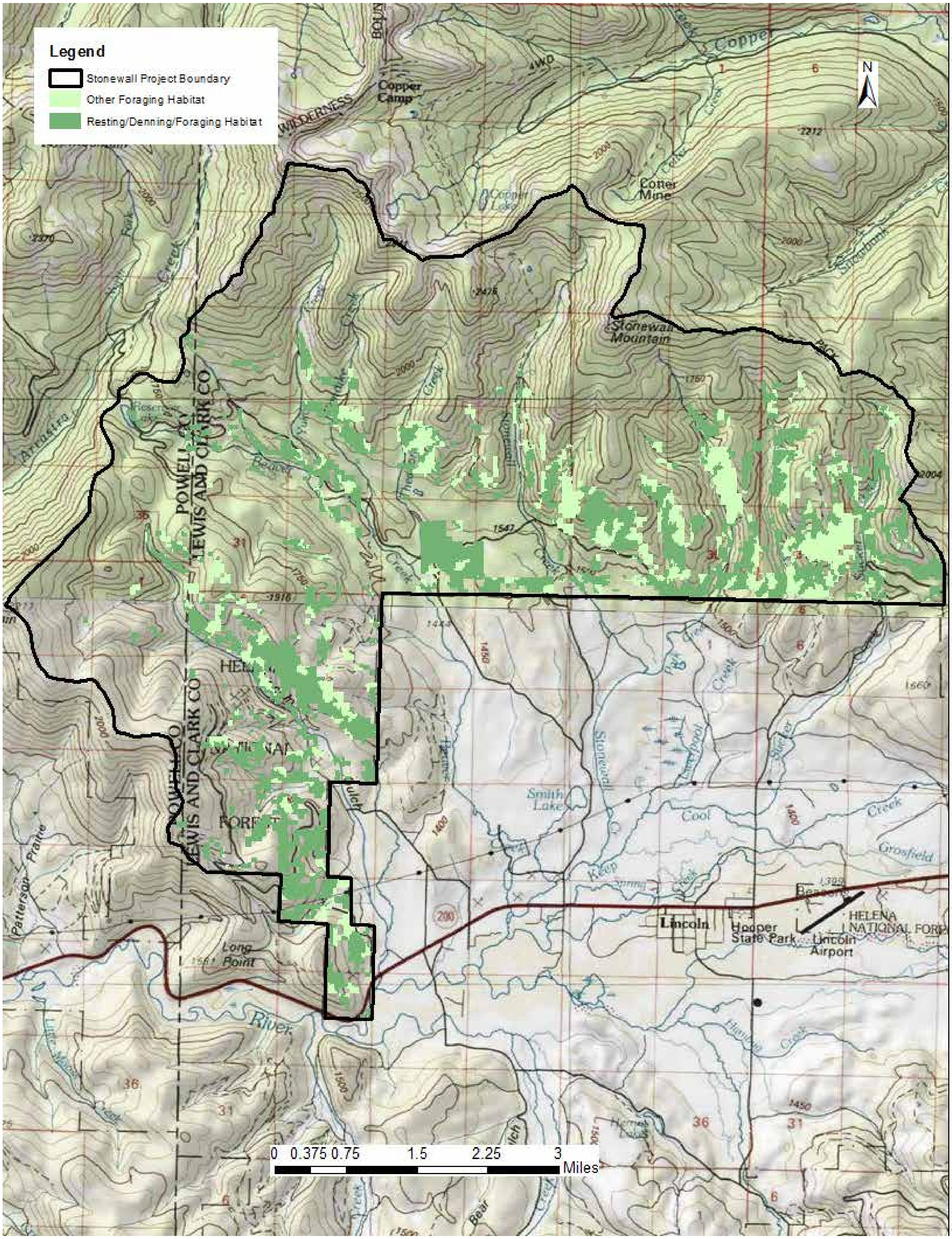


Figure 83. Alternative 1 fisher habitat

Cumulative Effects

Past, present and future cumulative effects evaluated are discussed in volume 2, appendix C. Cumulative effects are evaluated across the 101,977-acre combined boundary described previously, which contains approximately 9,500 acres of suitable fisher habitat. In addition to future MPB mortality, ongoing and future activities likely to affect fisher are displayed in table 109.

Table 110. Fisher cumulative effect summary

Activity	Foraging Habitat	Den/Rest Habitat
Invasive Plants Treatment	64 acres	442 acres
Trail Work (within 100 ft. of trail)	14 acres	22 acres
Prescribed Fire	8 acres	40 acres
Hazard Tree Removal	27 acres	118 acres
Stream Improvement	4 acres	3 acres
Recent (since 2011) Wildfire	2 acres	39 acres
Firewood collection	Within 100 ft. of open roads	Within 100 ft. of open roads

While all of the activities could result in short-term disturbance to fisher during treatment, there are no long-term effects anticipated. While there would be little change in habitat from NNIS treatment, trail work or stream habitat improvement, hazard tree removal and firewood collection would reduce downed wood, whereas prescribed fire would reduce downed wood and alter understory vegetation. While all of these treatments would reduce habitat quality, there would be little change in the overstory and the availability of fisher habitat would be maintained.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated for fisher. While implementation of alternative 1 may increase the risk of stand-replacing wildfire, there are no predictable irretrievable commitments.

Determination and Conclusions

Due to past MPB mortality, the availability of suitable fisher habitat has been reduced within the project area and on-going mortality is expected to further reduce canopy closure and fisher habitat in the next five to ten years. While suitable habitat would continue to be available, use of the project area would likely change and implementation of alternative 1 **may impact individuals, but are not likely to cause a trend toward federal listing.**

Action Alternatives

Direct and Indirect Effects

A total of 2,453 acres and 1,640 acres of fisher habitat fall within treatment units under alternative 2 and 3 respectively, although not all of this would be affected. Alternative 3 was developed to meet project objectives while reducing impacts to mature forest species such as fisher that require closed canopy forest and complex understory structure. As a result fewer acres of fisher habitat are affected under this alternative and more treatment sites would maintain closed canopy conditions. The following is a discussion of the differences between treatments under the action alternatives.

All of the proposed treatments have the potential to adversely affect fisher due to disturbance during implementation. The likelihood of disturbance is reduced when you consider; that most of the project area does not provide landscape conditions preferred by fisher, ,that habitat will continue to be reduced with on-going MPB mortality, that regeneration harvest is proposed in areas of concentrated mortality that provide marginal habitat, that surveys in the Beaver Creek drainage where most of the harvest is proposed did not document fisher use, and that riparian habitat, which provides movement corridors and preferred denning habitat would be maintained.

Table 110 displays existing fisher habitat, fisher habitat affected by treatment and post-treatment fisher habitat under the action alternatives.

Table 111. Effects to fisher habitat by action alternative

Habitat Conditions	Alternative 2			Alternative 3		
	Den	Foraging	Total	Den	Foraging	Total
Acres Existing Habitat	3,042	1,369	4,411	3,042	1,369	4,411
Acres Habitat Reduced	994	287	1281	470	135	605
Acres Post-tmt Habitat (% of existing habitat)	2,048 (67%)	1,082 (79%)	3,130 (71%	2,571 (85%)	1,233 (90%	3,805 (86)
Acres Structure Reduced[1]	543	331	874	433	233	666
Acres of Unaffected Habitat[2] (% of existing habitat)	1,505 (49%)	751 (55%)	2,256 (51%)	2,138 (70%)	1,000 (73%)	3,139 (71%)

[1] – habitat affected by low severity burning and intermediate harvest that maintains 40 percent canopy closure
[2] – includes INFISH buffer habitat

Alternative 2

Direct and Indirect Effects

Approximately 1,505 acres of existing den/rest (49 percent) habitat and 751 acres of other foraging habitat (54 percent) would be unaffected and effects would be similar to those described under alternative 1. A total of 2,171 acres of fisher habitat fall within treatment units and post-treatment suitable habitat that would result under this alternative is displayed in figure 84.

Many of the treatments proposed under this alternative have the potential to result in disturbance during implementation. While the possibility exists that a den or foraging/dispersing individual could be affected, the likelihood is reduced when you consider that (1) many of the treatments would occur outside the denning period, (2) preferred riparian habitat would be maintained (3) most of the harvest occurs in areas with concentrated pine beetle mortality that provide less preferred habitat and (4) surveys in the Beaver Creek drainage where much of the treatment occurs did not document fisher use. As a result the likelihood of direct effects are considered low. While some new road construction would occur under this alternative, because public access would not increase and considering all roads would be obliterated following use, there would be no increase in trapping pressure or associated mortality.

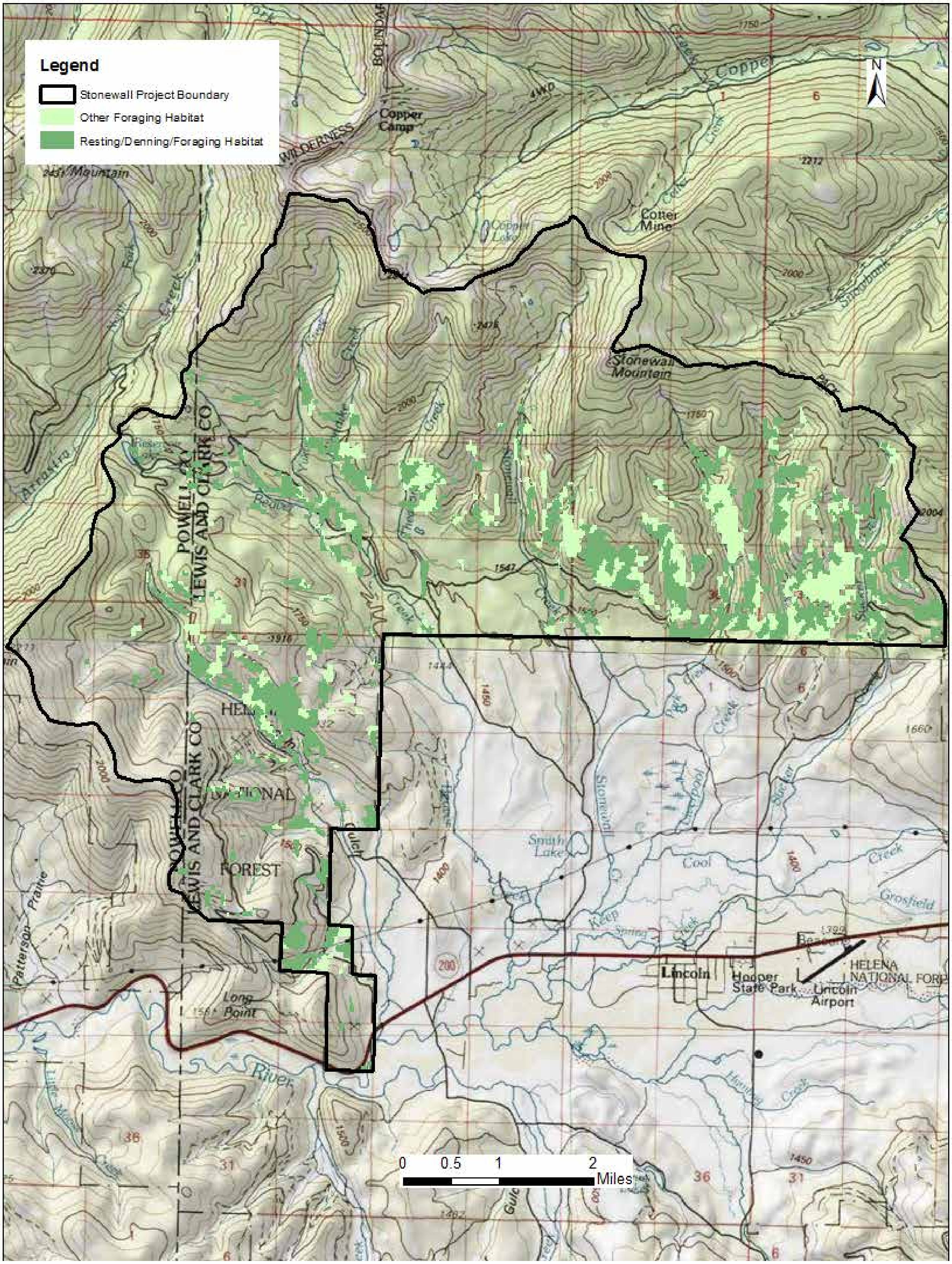


Figure 84. Alternative 2, fisher habitat and treatments

Changes to suitable fisher habitat under this alternative would vary by treatment. Because most intermediate harvest and regeneration treatments would reduce canopy cover below 40 percent, existing habitat affected would be made unsuitable. Suitable fisher habitat within intermediate harvest would be restored within 10 to 15 years, whereas regeneration harvest would result in a long-term reduction in habitat. Habitat would also be reduced on mixed severity burn sites that experience high intensity burning. Post-treatment under this alternative suitable fisher habitat would occur on approximately 3,130 acres (71 percent of existing habitat), including 2,048 acres of den/rest (67 percent of existing habitat) and 1,082 acres (79 percent of existing) of other foraging habitat. With implementation of harvest and burning restrictions within INFISH buffers, canopy closure and suitable habitat would be maintained within riparian areas.

While low severity burning and some of the partial harvest treatments would maintain 40 percent canopy closure and suitable fisher habitat, because downed wood would be removed during treatment, these activities would reduce understory structure and fisher habitat quality on an additional 543 acres of den/rest habitat and 331 acres of foraging habitat. With implementation of pdfs all units would continue to provide between 5 and 20 tons per acre of downed wood, as well as large-diameter logs. As a result and considering the large amount of standing and downed wood within all project area watersheds and retention of downed wood within riparian areas, downed wood will continue to be available at both the stand and landscape level.

Approximately 1.8 miles of new road construction would traverse suitable fisher habitat under this alternative, although no roads would be open to the public and all roads would be obliterated following implementation.

Spatial changes in habitat resulting under this alternative can be evaluated by comparing figure 83 and figure 84. Because lower Beaver Creek and Lincoln Gulch have a large lodgepole component and concentrated pine beetle mortality, most of the timber harvest and the greatest reduction in suitable fisher habitat occurs here and habitat connectivity within these drainages would be reduced under this alternative. Effects of these changes on fisher use are determined in part by the landscape conditions and amount of closed canopy mature forest (Heinmeyer and Jones 1994). As described under alternative 1, closed canopy forest has been recently reduced due to pine beetle mortality and the project area does not currently provide the landscape conditions preferred by fisher. While stands affected by MPB mortality would have elevated levels of dead wood, suitable habitat in the Beaver Creek and Lincoln Gulch drainages would be further reduced within the next five to ten years as canopy closure continues to decline. So while treatment under this alternative would reduce habitat connectivity in these drainages, use of the project area by fisher would be reduced.

As described under affected environment, fishers are strongly associated with riparian zones (Jones 1991, Heinmeyer and Jones 1994, Ruggiero et al. 1994), riparian areas are used extensively as travel corridors (Heinmeyer and Jones 1994), and prey are more readily available within forested riparian areas (Heinmeyer and Jones 1994, Jones 1991). With implementation of INFISH buffers, live trees would not be cut, increased amount of dead and down material would be left and existing riparian habitat would be maintained.

Alternative 3

Approximately 2,138 acres of existing den/rest habitat and 1,000 acres of foraging habitat (73 percent) would be unaffected and effects would be similar to those described under alternative 1. Under alternative 3 timber harvest and mixed-severity burning would be reduced; a total of 1,272 acres of suitable fisher habitat would be affected, including 904 acres of den/rest habitat and 369 acres of other foraging habitat. Post-treatment suitable habitat that would result under this alternative is displayed in figure 85.

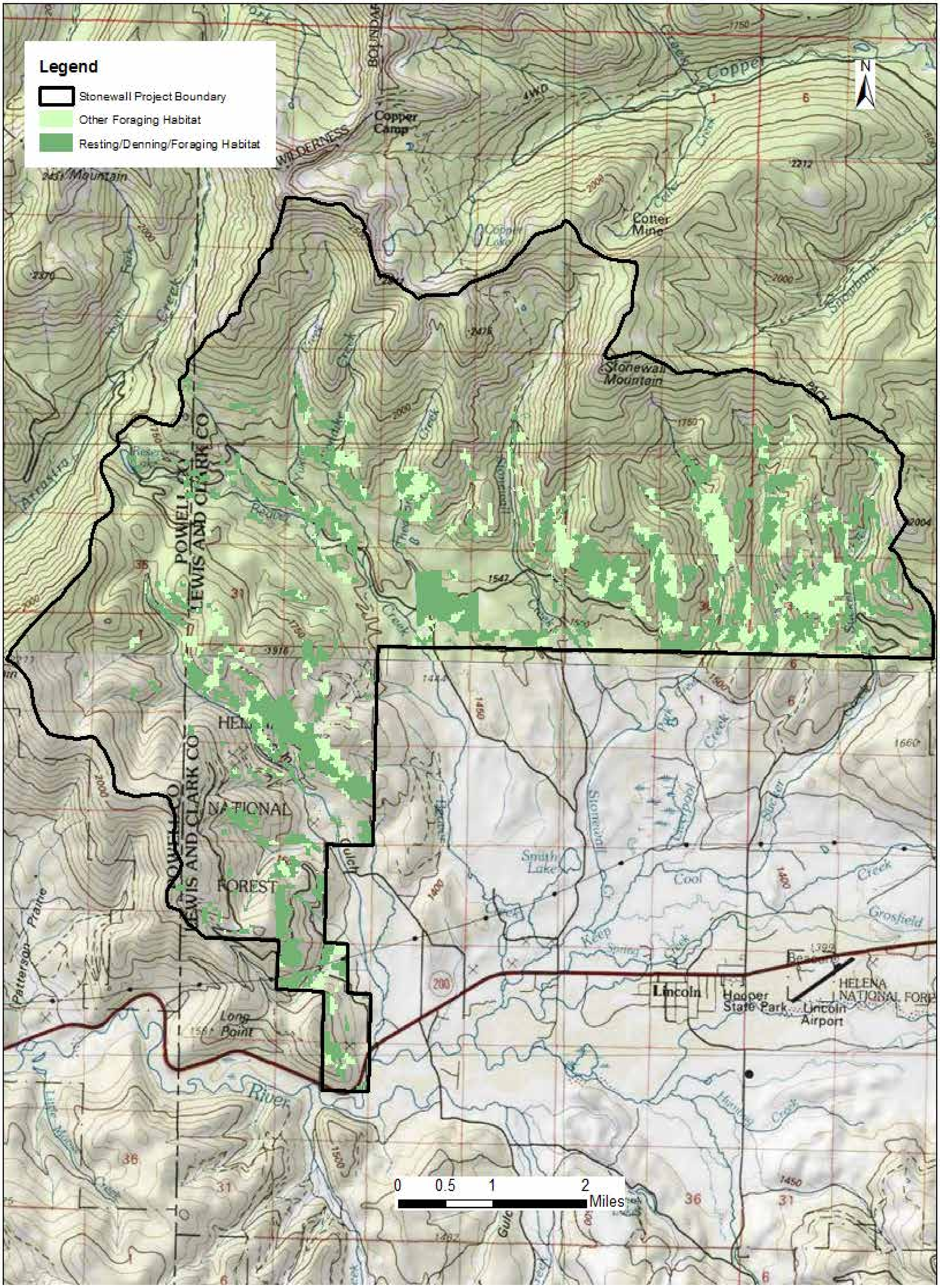


Figure 85. Alternative 3, fisher habitat and treatments

Potential direct effects would be similar to those described under alternative 2, although because fewer acres of den/rest habitat would be treated, the likelihood that a den would be affected is reduced under this alternative. Similarly, because treatment would be eliminated on 883 acres (when compared to alternative 2), the likelihood of disturbance to non-denning individuals is also reduced. Road construction within suitable fisher habitat would occur on 0.3 miles and like alternative 2 there would be no changes in public access or trapping pressure.

Because treatments under alternative 3 retain more closed canopy forest, approximately 86 percent of the existing suitable habitat or approximately 3,805 acres would be retained, including 2,571 acres of existing den rest habitat (85 percent) and 1,233 acres of existing foraging habitat (90 percent). While alternative 3 would retain more suitable habitat, because some harvest treatments are replaced by prescribed burning, the total acres where habitat quality would be reduced would be similar to those of alternative 2. Under alternative 3 habitat quality would be reduced on 233 acres of foraging and 433 acres of den rest habitat. Like alternative 2, while treatment would reduce the availability of dead wood, with implementation of PDF’s all units would continue to provide between five and twenty tons per acre of downed wood and a component of large diameter logs. As a result and considering the large amount of standing and downed wood within all project area watersheds (see section 4.5.7) and retention of downed wood within riparian areas and on 20 percent of prescribed burn sites, downed wood will continue to be available at both the stand and landscape level.

As shown in figure 85, treatment changes under alternative 3 would retain larger blocks of closed canopy forest in both the Beaver Creek and Lincoln Gulch drainages. While project area use by fisher is considered low, habitat connectivity would be better maintained under this alternative.

Cumulative Effects

In addition to cumulative effects described under alternative 1, the action alternatives would result in up to the following (alternative 2)

- Prescribed burning on 438 acres of foraging habitat and 690 acres of den/rest habitat
- Regeneration harvest on 48 acres and 229 acres of foraging and den/rest habitat.
- Partial harvest on up to 146 acres and 620 acres of foraging and den/rest habitat.

Cumulatively during the analysis period, up to approximately 751 acres or 25 percent of the available foraging habitat would be affected and up to 2,203 acres or 34 percent of the available den/rest habitat would be affected. Closed-canopy conditions and suitable fisher habitat would be maintained on approximately 60 percent of the acres affected. Preferred riparian habitat and travel corridors would be retained, structural conditions preferred by fisher would be maintained, and habitat would continue to be available to accommodate use of the project area by fisher.

Irreversible and Irretrievable Commitments

Alternatices 2 and 3

There are no irreversible commitments anticipated for fisher. While both action alternatives would reduce suitable habitat on areas affected by harvest and alter structural diversity on fisher habitat, suitable habitat conditions would be restored on all sites.

Determination and Conclusions

Alternative 2

Based on the above analysis and the following rationale, implementation of alternative 2 **may impact individuals, but are not likely to cause a trend toward federal listing** for fisher.

- Due to widespread mountain pine beetle mortality, available fisher habitat has been reduced, and much of the project area does not provide the overstory or landscape conditions preferred by fisher. As a result, the likelihood of direct effects is low.
- Approximately 79 percent of the existing foraging habitat and 67 percent of the existing den/rest habitat would be maintained and 51 percent of existing habitat unaffected. Preferred riparian habitat would be largely unaffected and connectivity of existing habitat would be maintained outside of areas with concentrated MPB mortality.
- There would be no increase in open roads and fisher security habitat would be unchanged. Also there is no anticipated increase in trapping pressure.
- Proposed treatments are designed to reduce the risk of stand-replacing wildfire and a possible long-term loss of fisher habitat.
- Fisher habitat is well distributed across the forest and the Northern Region (Samson 2006b). Distances between areas of suitable habitat are within dispersal distance characteristic of this species.

Alternative 3

Alternative 3 strives to meet project objectives, while reducing effects to mature forest species. Based on the above analysis and the following rationale, implementation of alternatives 3 may impact individuals, but are not likely to cause a trend toward federal listing for fisher.

- Due to widespread mountain pine beetle mortality, available fisher habitat has been reduced, and much of the project area does not provide the overstory or landscape conditions preferred. As a result, the likelihood of direct effects is low.
- Approximately 90 percent of the existing foraging habitat and 85 percent of the existing den/rest habitat would be maintained, whereas 71 percent of existing habitat unaffected. Preferred riparian habitat would be largely unaffected and connectivity of existing habitat would be largely maintained in all drainages.
- There will be no increase in open roads and fisher security habitat will be unchanged. There is no anticipated increase in trapping pressure.
- Proposed treatments are designed to reduce the risk of stand-replacing wildfire and a possible long-term loss of fisher habitat.
- Fisher habitat is well distributed across the Forest and the Northern Region (Samson 2006b). Distances between areas of suitable habitat are within dispersal distance characteristic of this species

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Fisher habitat would be maintained under alternative 1. While both action alternatives would reduce suitable fisher habitat and alter structural conditions, the likelihood of mortality is low, any disturbance would be short term, preferred riparian habitat would be protected, and human access and trapping pressure would not change. As a result, all alternatives are consistent with Forest Plan (USDA Forest Service 1986) direction to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17), to provide habitat for small game, furbearers and other wildlife species (p. II/4), to manage riparian areas to be compatible with dependent wildlife species (II-35) and to develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs (p. II/2). All alternatives are also consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12

Townsend's big-eared bat

Alternative 1

Direct, Indirect and Cumulative Effects, and Determination

There are no treatments proposed under this alternative and suitable foraging habitat would remain largely unchanged. There are no direct or indirect effects. Project area cumulative effects are identified in volume 2, appendix C. Activities that are most likely to alter foraging habitat are displayed below.

- Campground rehabilitation – 5 acres
- Grazing – 5,977 acres
- NNIS treatment – 312 acres
- Hazard tree removal – 318 acres
- Stream rehabilitation – 15 acres
- Trail work – 5 acres
- Recent wildfire – 10 acres
- Firewood collection within 100 feet of open roads
- Continued MPB mortality

While these activities may alter habitat conditions on a localized basis, landscape-level foraging habitat would be largely unchanged and there are no significant cumulative effects anticipated. As a result, implementation of alternative 1 would have **no impact** on the Townsend's big-eared bat.

Action Alternatives

Direct and Indirect Effects

The project area does not provide suitable hibernacula or roost sites and only foraging bats would be affected. Because bat activity occurs at night or at dawn/dusk, it is unlikely timber harvest would result in direct effects (harm or harassment). While it is possible that smoke from prescribed burning could occur on a site when bats are actively foraging, all burning must adhere to state air quality standards and prior to implementation a prescribed burn plan would be developed. Smoke management is an important part of the burn plan and adherence to atmospheric guidelines helps to ensure that smoke is quickly dispersed. As a result, any smoke related impacts would be short term.

Proposed treatments would affect 8,562 and 6,562 acres of forested habitat under alternatives 2 and 3 respectively. Increased structural diversity would result from burning, and bat prey diversity and foraging habitat would be maintained or improved on sites burned. The remaining treatments would involve partial or intermediate harvest and regeneration harvest activities. Because this species typically does not use regenerating forest (Gruver and Keinath 2006), suitable foraging habitat would be reduced on 4 and 3 percent of the project area under alternatives 2 and 3 respectively. Because partial harvest would maintain a mature overstory while increasing understory development, treatments would likely improve habitat by increasing prey diversity and reducing forest "clutter" which would improve maneuverability. Due to the variety of treatments proposed, considering over 60 percent of the project area would not be treated, and that foraging habitat would be improved on most of the acres affected by treatment, the project area would continue to provide a structurally diverse forest to support a diversity of prey for foraging.

Cumulative Effects

Cumulative effects are evaluated across the project area. A complete list of activities found within the project area can be found in volume 2, appendix C. In addition to cumulative effects described under alternative 1, foraging habitat would be affected on up to 5,463 acres of prescribed burning, 968 acres of regeneration harvest and 2,131 acres of partial harvest.

Of these activities, only regeneration harvest would likely modify the overstory to a level that would affect bat foraging habitat. Because treatments would increase stand and landscape diversity, it is likely that invertebrate diversity or bat foraging habitat would be maintained or improved. As a result, forested structural diversity and Townsend's big eared bat foraging habitat would continue to be available across the landscape.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments anticipated for Townsend's big-eared bat. The action alternatives would reduce suitable habitat on areas affected by regeneration harvest and alter structural diversity on sites proposed for partial harvest or burning; however, suitable habitat conditions would be maintained or restored on all sites.

Determination

The action alternatives would affect suitable habitat on 27 to 35 percent of the project area. Based on the above analysis and the following rationale, implementation of alternatives 2 and 3 **may impact individuals, but are not likely to result in a trend towards federal listing** for the Townsend's big-eared bat.:

- The project area does not provide suitable hibernacula or roost sites and the closest known hibernacula is over 30 miles from the project area, minimizing use of the area by foraging bats.
- Over 60 percent of the project area would not be treated; a diversity of habitat conditions would occur and suitable foraging habitat would continue to be available under both alternatives.
- While suitable foraging habitat would be affected on up to 4 percent due to proposed regeneration harvest, collectively, proposed treatments are be expected to improve foraging habitat.
- Proposed treatments would reduce risk of wildfire and insect- and disease-related mortality and reduce the likelihood of large stand-replacing wildfire.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

No hibernacula or roost sites would be affected and suitable foraging habitat would be maintained or improved. As a result all alternatives are consistent with Forest Plan (USDA Forest Service 1986) direction to; provide habitat for small game, furbearers and other wildlife and fish species (p. II/4) and to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17). All alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Bald Eagle

Alternative 1

Direct, Indirect and Cumulative Effects and Determination

There are no treatments proposed, so there are no direct or indirect effects anticipated. Cumulative effects are summarized in volume 2, appendix C. Cumulative effects likely to affect the bald eagle during the analysis period include off-forest timber harvest and private land development, continued use along the Blackfoot River and a possible loss of future nest trees due to MPB mortality. While there could be a localized reduction in suitable nest trees, available nest, foraging and roost habitat would remain largely unchanged and there are no significant cumulative effects anticipated for the bald eagle. As a result, implementation of alternative 1 would have **no impact** on the bald eagle.

Action Alternatives

Direct and Indirect Effects

The nearest known existing eagle nest is approximately 1.5 miles from proposed treatment. With implementation of pdfs to restrict aircraft during the breeding season and which require dispersal of smoke away from the nest, there are no direct effects to nesting birds or reproduction anticipated.

Disturbance and disruption of roosting/foraging birds can adversely interfere with feeding and affect productivity or survival of young (USDI Fish and Wildlife Service 2007a). Disturbance to foraging birds could occur because some burning and timber harvest is proposed within approximately 350 feet of suitable foraging habitat along the Blackfoot River. However, there are no communal roost sites or established foraging areas affected. As a result, and considering the small portion of the river affected (1.5 miles within 0.25 mile of a treatment) and widespread availability of unaffected foraging/roosting habitat, any adverse effects associated with smoke or disturbance are expected to be short term.

Proposed regeneration harvest would remove approximately 100 acres of potential bald eagle nest habitat within 1 mile of the Blackfoot River. These lands are immediately adjacent to Highway 200 and existing private land development. As a result they do not provide preferred bald eagle nest habitat. Further, unaffected nest habitat would continue to be widely available

Cumulative Effects

In addition to cumulative effects discussed under alternative 1, implementation of treatments under the action would reduce potential nest trees on lands adjacent to the Blackfoot River. Also, birds foraging along the river may be disturbed during treatment. However, any disturbance effects would be short term. Bald eagle nest, foraging and roost habitat would remain largely unchanged and implementation of project design features would protect existing and future nests. As a result, and considering future uses are not expected to change and that eagles have successfully nested in this area with ongoing uses, there no significant cumulative effects anticipated.

Irretrievable and Irreversible Commitments

There are no irretrievable or irreversible commitments anticipated for the bald eagle under this alternative.

Determination and Conclusions

Proposed activities have the potential to result in short-term disturbance to foraging eagles, although with implementation of project design features, there would be no impacts to nesting birds. Existing habitat in the project area habitat would be largely unaffected. As a result alternatives 2 and 3 **may impact individuals, but are not likely to result in a trend toward federal listing** for the bald eagle.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

There would be no effects to eagles under alternative 1, while alternatives 2 and 3 propose treatment within suitable eagle nesting and foraging habitat, with implementation of pdfs the likelihood of impacts to nesting birds is low. As a result and because of the small amount of habitat treated and availability of unaffected nesting and foraging habitat along the Blackfoot River corridor, both alternatives are consistent with Forest Plan (USDA Forest Service 1986) direction to; provide habitat for small game, furbearers and other wildlife species (p. II/4) and to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17). Also all alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12. Additionally, both alternatives comply with the Bald and Golden Eagle Management Act and are consistent with direction provided in the 2007 National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007a).

Black-backed Woodpecker

All Alternatives

Under all alternatives, insect infestations would continue to create snags and lower quality habitats. Suitable post-fire habitat currently occurs on over 100,000 acres of the HNF. Of this, almost 23,000 acres occur within or immediately adjacent to the Stonewall project area. Consequently suitable BBW habitat across the Forest and in the vicinity of the project area is widely available on areas that have recently burned. As a result and considering the availability of burned habitat region-wide, adequate habitat exists across the landscape to maintain viable BBW populations (Samson 2006a).

Alternative 1

Direct, Indirect, Cumulative Effects and Determination

There are no treatments proposed, so there would be no direct effects and the existing vegetation condition and BBW habitat would remain largely unchanged. Insect-infested trees would likely continue to provide limited foraging opportunities and suitable post-fire habitat would continue to be available northeast of the project area. The likelihood of stand-replacing wildfire would remain high and this alternative is most likely to result in development of high quality BBW habitat in the future.

Anticipated cumulative effects are in volume 2, appendix C. Activities that have affected BBW habitat includes fuel management activities, timber harvest and hazard tree removal activities that have reduced snags and suitable habitat; as well as past and recent wildfire and MPB mortality that have increased habitat. Future activities that would reduce BBW habitat include continued hazard tree removal, private timber harvest and firewood collection. While habitat quality associated with the Snow Talon fire has declined, smaller acreages of more recent wildfire has occurred within the analysis area and secondary habitat in MPB mortality is widespread. As a result and considering the BBW is capable of surviving in non-post fire areas (Hoyt and Hannon 2002 In Samson 2006a), suitable black-backed woodpecker habitat will continue to be available. Additionally, the risks of future wildfire, which would create future BBW habitat is greatest under this alternative and implementation of alternative 1 will have **no impact** on the black-backed woodpecker.

Action Alternatives

Direct Effects and Indirect Effects

While the possibility exists that a woodpecker could be affected, recently burned lands within the project area that provide preferred BBW habitat would not be treated. As a result the likelihood of mortality or disturbance is low.

Effects of treatment would be similar to those described under the dead wood section. Proposed harvest would reduce tree susceptibility to insects in all treatment units thereby reducing hazard from bark beetles. Unaffected areas of mortality will continue to be widely available and it is not anticipated that treatment would alter landscape level use by the BBW. Standing dead trees would be managed to Forest Plan standards, although snag density and suitable habitat would be reduced. A reduction in fire risk associated with the action alternatives would reduce potential black-backed woodpecker habitat in the analysis area, given their dependence on recently burned forests.

Alternative 2

Indirect Effects

Alternative 2 would reduce BBW habitat on approximately 3,100 acres receiving a timber harvest treatment. Proposed mixed-severity burning would result in recruitment of new snags including some large patches with higher snag density, therefore, BBW foraging habitat would be improved on approximately 1,200 acres affected by high-intensity burning. Lands proposed for low-intensity burning would remain largely unchanged.

Alternative 3

Indirect Effects

Alternative 3 would reduce snags and low quality BBW foraging habitat on 1,895 acres proposed for timber harvest, whereas lands proposed for low-intensity burning would remain relatively unchanged. Like alternative 2, proposed mixed-severity burning would increase snags and potential high quality BBW foraging habitat on approximately 800 acres.

Alternatives 2 and 3

Cumulative Effects

In addition to cumulative effects under alternative 1, there would be a reduction in snags and low-quality habitat on up to approximately 3,100 acres (alternative 2), whereas high-quality habitat would be increased in high-intensity burned areas. As described under the dead wood section, snag densities within all affected watersheds would remain high. Also lands affected by recent wildfire would continue to provide primary habitat, whereas secondary habitat, or lands with MPB mortality, would continue to be available across the landscape.

Irretrievable and Irreversible Commitments

There are no irretrievable or irreversible commitments. Both alternatives would result in a decrease in low-quality habitat and an increase in high-quality habitat for the black-backed woodpecker.

Action Alternatives Determination

Proposed activities would reduce suitable habitat for this species and reduce the risk of high-intensity wildfire. Based on the above analysis and the following rationale, implementation of alternatives 2 and 3

may impact individuals or habitat, but would not likely contribute towards a trend in federal listing for the black-backed woodpecker.

- Proposed mixed-severity burning would be expected to create high quality habitat on over 800 acres.
- Because only low-quality habitat is affected, and considering existing high-quality habitat would not be treated, the likelihood of direct mortality or disturbance from treatment is low.
- Evidence suggests that the black-backed woodpecker is increasing in the United States (Dixon and Saab 2000). No demographic information exists to suggest a decline in BBW numbers.
- Black-backed woodpecker habitat is abundant and well-distributed across the Forest and the Northern Region. Distances between areas of suitable habitat are within dispersal distance characteristic of this species.
- Habitat for the black-backed woodpecker has recently increased, and amounts are expected to increase as fires and bark beetle outbreaks continue to increase in size (Samson 2006b).
- A comparison of habitat required for a viable population, indicates well-distributed habitat greatly exceeds that needed, given the natural distribution of species and their habitats as mapped and according to available scientific literature (Samson 2006b).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Black-backed woodpecker habitat would be unchanged under alternative 1. Because high- quality BBW habitat would not be treated under the action alternatives, and considering that all sites proposed for treatment would meet or exceed levels of snags and downed woody debris recommended in the Forest Plan (USDA Forest Service 1986 p. II/20-21), all alternatives are consistent with Forest Plan direction to provide habitat for small game, furbearers and other wildlife species (p. II/4) and to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17). Also all alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Flammulated Owl

Effects to flammulated owls are evaluated by looking at the amount of available Dry Forest habitat by alternative and by looking at the amount and distribution of large-diameter snags.

Alternative 1

Direct and Indirect Effects

No treatments are proposed under this alternative and there are no direct effects. Conifer stands not affected by MPB mortality would continue to succeed and closed canopy conditions would increase. Mountain pine beetle infested stands would shift to predominantly Douglas fir. As described under the biophysical setting discussion, in the absence of fire, the open-canopy dry forest and ponderosa pine component would continue to decline. Snag densities including a component of large-diameter ponderosa pine snags would remain high for 10 to 20 years, then would decline after this period as existing snags fall to the ground. Over time, flammulated owl habitat would decline due to the continued reduction in open canopy dry forest and large diameter ponderosa pine snags.

While the effects of fire on this species have not been well studied, it is known that fire suppression has led to a stand structure that did not characterize ponderosa pine forests prior to European settlement (Hayward and Verner 1994). The dense stands of conifer regeneration may provide suitable roosting habitat, but the dense shade would reduce grasses and forbs that provide habitat for many prey species.

Also owls have difficulty flying through the dense forests (Hayward and Verner 1994). Due to continued fire suppression and predominance of understory conifer, roosting habitat would continue to increase, whereas flammulated owl foraging habitat would decline.

Cumulative Effects

As described under methodology, cumulative effects are evaluated across the combined boundary. Anticipated cumulative effects are summarized and discussed in section 4.4, whereas a complete list of past, ongoing and future activities considered can be found in appendix A of this report. Past activities include commercial and non-commercial timber harvest, reforestation treatments, fuel treatments, grazing, mining, special use and outfitter guide permitting, motorized and non-motorized recreational use and wildfire. Effects of these activities vary spatially and temporally. While understory vegetation was reduced immediately following partial harvest, reforestation and fuel treatments, vegetation and flammulated owl prey habitat has been largely restored. Similarly, overstory conditions on older regeneration harvest sites and sites affected by sanitation and intermediate harvest have closed, whereas more recent treatments (since 2000), continue to have more open overstory conditions. Effects of these treatments are reflected in the existing flammulated owl habitat.

In addition to management activity, approximately 23,000 acres have been affected by more recent wildfire (2003 to 2009). Most of this occurred as high intensity wildfire associated with the 2003 Snow Talon fire in the Copper Creek and Landers Fork drainages in the northeast corner of the analysis area. Overstory mortality within these drainages was widespread and flammulated owl habitat largely eliminated. Insect and disease related mortality has affected many low elevation stands and has increased large diameter snags and created more open canopy conditions. Vegetation and flammulated owl habitat changes resulting from recent wildfire and MPB mortality is reflected in the existing flammulated owl habitat condition.

On-going/future activities discussed in section 4.4 include personal use firewood collection, approximately 27 acres of off-forest timber harvest, 13 acres of hazard tree removal, 8 acres of prescribed fire and 20 acres of recent (since 2011) wildfire. The following is a discussion of effects of these treatments on owl habitat.

Private Timber Harvest - Potentially suitable flammulated owl habitat would be reduced on approximately 27 acres.

Prescribed Burning - Effects for prescribed burning would be similar to those described under low intensity burning in section 4.3 and consist primarily of changes to understory vegetation, although some individual tree mortality may occur. Nesting habitat affected would be maintained, whereas roosting habitat would be reduced.

Hazard Tree Removal - Effects include short-term displacement during treatment and a long-term reduction in suitable nest trees on approximately 13 acres..

Recent Wildfire - Effects vary depending on the intensity of burning. Owl habitat would be reduced on approximately 8 acres affected by more intense burning conditions, whereas effects would be similar to those described under prescribed burning on the 12 acres affected by lower severity burning.

Personal use Firewood Cutting - Firewood collection would reduce snags and downed woody debris along open roads, reducing flammulated owl nest habitat on lands affected.

Conclusion

While there would be some reduction in suitable nest trees and a likely continued decline in open canopy habitat as succession continues, there would be little change in flammulated owl habitat during the analysis period, whereas over time habitat would decline.

Irretrievable and Irreversible Commitments

There are no irreversible commitments anticipated. Due to the continued decline in open canopy dry forest habitat and large diameter ponderosa pine, implementation of alternative 1 is expected to result in a long-term irretrievable reduction in habitat for the flammulated owl.

Alternative 1 Determination

While there are no direct effects and existing habitat would remain largely unchanged, fire suppression would continue to reduce suitable flammulated owl habitat over the long term. As a result implementation of alternative 1 **may impact individuals, but would not likely contribute towards a trend in federal listing or cause a loss of viability.**

Action Alternatives

Table 111 displays treatments by action alternative within existing flammulated owl habitat and dry forest, whereas effects of treatment are described below.

Table 112. Alternative Treatment of Flammulated Owl Habitat

Treatment	Alt 2		Alt 3	
	Acres	%	Acres	%[1]
Suitable Flammulated Owl Habitat (1,456 acres)				
Intermediate harvest	162	11[1]	13	1[1]
Regeneration harvest/fire-created openings	126	9[1]	71	5[1]
Low severity burning	282	20[1]	305	21[1]
Currently Unsuitable Dry Forest Habitat (13,320 acres)				
Intermediate Harvest	1,874	14[2]	998	8[2]
Regeneration harvest/fire created openings	1,418	112	1,030	82
Low Severity burning	1,414	11[2]	1,355	10[2]

1-percent of suitable habitat

2-percent of project area Dry forest habitat

Direct and Indirect Effects

Flammulated owls appear tolerant of some human disturbances, as this species has been known to nest in campgrounds and other areas of human activity with no apparent adverse effects (Hayward and Verner 1994). While proposed treatments have the potential to affect nesting birds, because owls appear tolerant of human activities and considering pdfs would retain all snags over 20 inches d.b.h., the likelihood of mortality is low. Similarly, disturbance to nesting/foraging birds would be short term during treatment.

Due to the retention of large diameter trees and snags and approximately 25 to 45 percent canopy closure, existing owl habitat would be maintained on sites proposed for thinning, whereas thinning in currently unsuitable dry forest habitat would create the open stand conditions that characterize owl habitat (Hayward and Verner 1994). Suitable flammulated owl habitat would be reduced on sites proposed for regeneration harvest and it would take several decades for habitat to be restored on these sites, or for suitable stand structure conducive to flammulated owl habitat to be created. All sites proposed for harvest would reduce snag density.

Effects of proposed burning would vary. Because proposed low severity burning would promote open canopy conditions while retaining large diameter trees/snags, nesting and foraging habitat would be improved on these sites. While nesting/roosting habitat would be reduced in fire created openings associated with mixed severity burning, because edges are preferred for foraging and can increase prey density and foraging maneuvers used by the owl (Hayward and Verner 1994), over time (greater than 5 years), foraging habitat would improve within fire created openings. Both low-severity and mixed -severity burning would leave 20 percent of sites untreated, promote establishment of grasses, forbs and shrubs (preferred prey habitat), and retain large diameter trees. The mosaic of conditions provided, would improve both stand and landscape level flammulated owl habitat.

While proposed thinning would improve habitat for some predators such as the great-horned owl, preferred habitat for other predators such as the northern goshawk would be reduced (Hayward and Verner 1994). Treatments would create protective roosting cover in close proximity to nesting and foraging habitat and risks from predation are expected to remain unchanged.

Alternative 2

Treatments under this alternative would reduce existing nesting/forging habitat on approximately nine percent due to regeneration harvest and fire created openings, whereas nesting habitat would be maintained sites proposed for intermediate harvest. Proposed low severity burning and intermediate harvest would improve habitat preferred by many prey species, including improved foraging on 20 percent of the existing owl habitat.

Over time, proposed intermediate harvest would create stand conditions characteristic of owl nesting habitat on approximately 14 percent of the currently unsuitable dry forest, although use would vary depending on individual site conditions (Wright 1992, Hayward and Verner 1994). Sites that retain higher canopy closure and a greater number of large diameter trees/snags are more likely to be utilized or would receive use sooner. Foraging habitat would also be improved on sites proposed for intermediate harvest, as well as on sites proposed for low severity burning (11 percent) due to the more open understory conditions and increase in grass/forbs and arthropod prey (Hayward and Verner 1994).

Alternative 3

Alternative 3 reduces regeneration harvest and mixed severity burning and 95 percent of the existing flammulated owl habitat would be maintained. Existing habitat would be improved by approximately 22 percent under this alternative due to low severity fire and intermediate harvest.

Like alternative 2, proposed treatments would promote conditions characteristic of flammulated owl habitat within currently unsuitable dry forest. Open canopy conditions and nesting/foraging habitat would be improved on approximately 1,000 acres proposed for intermediate harvest, whereas low severity fire would improve foraging habitat on another 1,355 acres.

Alternatives 2 and 3

Cumulative Effects

In addition to cumulative effects described under alternative 1, flammulated owl habitat would be affected by the following activities within the combined boundary. The acres displayed would be the maximum treatment proposed (alternative 2).

- Partial Harvest – 162 acres
- Regeneration Harvest/Fire-Created Openings – 126 acres
- Low Severity Burning – 482 acres

Proposed treatments would reduce flammulated owl habitat by up to 126 acres and affect stand structure on approximately 440 acres or 30 percent of existing habitat. Over 98 percent of the existing habitat would be maintained, whereas nest and foraging habitat would be improved on approximately 3,288 acres or 13 percent of the existing dry forest. While treatments may result in short-term disturbance during treatment, the likelihood of mortality is low and flammulated owl habitat would be maintained in the short term and improved over the long term. Landscape conditions consistent with flammulated owl use would be maintained or improved.

Irretrievable and Irreversible Commitments

There are no irretrievable commitments anticipated. While there may be some reduction in nest habitat through cutting of hazard large-diameter snags and a small reduction in foraging habitat, proposed treatments would promote restoration of dry forest community that is required by the flammulated owl.

Action Alternative Determination

Both action alternatives would reduce suitable owl habitat on some of the sites treated, whereas other treatments would promote conditions preferred by the flammulated owl. Based on the above analysis, and the following rationale, implementation of alternatives 2 and 3 **may impact individuals or habitat, but would not likely contribute towards a trend in federal listing** for the flammulated owl**.**

- With implementation of pdfs that retain large-diameter snags during treatment, the likelihood of direct mortality is reduced.
- Ninty to 95 percent of the existing habitat would be maintained. Treatment would promote maintenance of ponderosa pine and future nest sites, improve foraging conditions on 20 percent of existing habitat and promote nesting/foraging habitat on between 18 and 25 percent of the ponderosa pine/dry Douglas-fir biophysical setting
- Proposed treatments would reduce the risk of large, stand-replacing wildfire.
- The level of timber harvest in the Northern Region is insignificant in relation to this species' habitat needs, and suitable habitat is well distributed across the Region (Samson 2006b).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Suitable owl habitat would be maintained in the short term under alternative 1. While the action alternatives would reduce suitable habitat, the likelihood of mortality or disturbance is low. Also, the action alternatives would meet or exceed Forest Plan (USDA Forest Service 1986) guidelines, ensure that large-diameter snags and nest trees are available in the future and provide snags across the landscape. Treatments would also increase available habitat over the long term and reduce the risk of catastrophic fire. All alternatives are consistent with Forest Plan (p. II/20-21), and regional guidelines related to snags, direction to provide habitat for small game, furbearers and other wildlife species (p. II/4) and to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17). Also all alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

4.6.10 Western Boreal Toad

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there are no direct effects anticipated. With continued fire suppression and high levels of fuel loading, the likelihood that suitable upland and riparian habitat would be reduced through severe wildfire would remain high under this alternative.

Cumulative Effects

Anticipated cumulative effects are in volume 2, appendix C. Few regulations were in existence in the 1950s and 1960s, so timber harvest and fuel activities on private and public lands extended into riparian areas, and it is likely treatment impacted boreal toads and their habitat. With implementation of Forest Plan standards in 1986 and more recently INFISH buffers, much of the breeding habitat on NFS lands has been maintained. As described under methodology, cumulative effects are evaluated across the project area and ongoing and future activities are the same as those described under the Townsend's big eared bat. All activities have potential for disturbance during treatment and activities that would be more likely to affect this species or its habitat include; stream rehabilitation on 15 acres, NNIS treatment on 312 acres, recent wildfire on 10 acres, firewood collection along open roads and cattle grazing on 5,977 acres.

A biological evaluation has (in the case of hazard tree removal) or would be completed to assess any future in-stream work or NNIS treatment; potential impacts to this species would be reduced through that process. Proposed invasive plants treatment would help to maintain native vegetation and suitable boreal toad habitat. Breeding habitat would continue to be affected by grazing, although use is not expected to change and impacts would be reduced with on-going riparian monitoring and allotment management plan compliance.

Alternative 1 Determination

There are no treatments proposed and implementation of alternative 1 would not contribute to any past, ongoing or reasonably foreseeable activities. Implementation of alternative 1 would have **no impact** on the western boreal toad.

Alternatives 2 and 3

Direct and Indirect Effects

Approximately 15,108 acres under alternative 2 and 17,107 acres under alternative 3 would be unaffected by treatment and effects would be similar to those described under alternative 1. Boreal toad habitat would be affected by proposed treatments on approximately 7,500 acres under alternative 2 and 5,600 acres under alternative 3.

Because this species is known to occur within breeding and upland habitat within the project area, direct effects include disturbance or mortality associated with burning or mechanical treatments. Riparian buffers would reduce potential impacts to breeding habitat, although there may be some temporary water sources that are not protected by a riparian buffer and trampling or mortality to boreal tadpoles or adults could occur. Because toads can disperse miles from breeding habitat, mortality of dispersing adults within mechanical harvest or burn units could also occur. The likelihood of mortality is low when you consider; that many harvest units would have untreated buffers and occur during the winter while toads are hibernating, that no fire ignition would not occur within breeding habitat, that burned areas would be interspersed with un-burned lands, that less mobile species (e.g., frogs and toads) are capable of either moving quickly to unburned refugia, or seeking out refugia in burrows and crevices (Kennedy and Fontaine 2009; Russell et al. 1999; Smith 2000; Yager et al. 2007), and that most of the project area would be unaffected by treatment. Alternative 3 reduces harvest and mixed severity burning by approximately a third; therefore, the risk of direct effects are lowest under this alternative.

Changes resulting from proposed treatments include a reduction in both understory and overstory vegetation which will affect suitable boreal toad habitat. With implementation of pdfs and INFISH buffers, suitable breeding habitat a within treatment units would be maintained. Within upland habitat, proposed regeneration and partial harvest would reduce habitat until understory shrubs and vegetation are re-established. While prescribed burning may be allowed to burn into riparian areas, no active ignition would occur. The low-intensity fire would help to reduce conifer encroachment and promote riparian shrub, grass and forb diversity, which would help to maintain habitat over the long term. Burning within upland habitat would also help to maintain or promote habitat, as boreal.

Cumulative Effects

In addition to cumulative effects discussed under alternative 1, up to approximately 7,500 acres of the project area would be affected by proposed activities (alternative 2). Suitable upland boreal toad habitat would be reduced, whereas breeding habitat within treatment units and across the landscape would be maintained. Proposed treatments would contribute to grazing effects, although pdfs would modify grazing use if necessary to reduce impacts. Over the long term, burning would help to maintain riparian and upland vegetation and promote foraging following treatment. Approximately 64 percent of the analysis area under alternative 2 and 72 percent under alternative 3 would be unaffected by on-going/future activities. Under both alternatives breeding habitat would be maintained within treatment units and across the landscape, upland foraging habitat would be improved over time, and suitable boreal toad habitat would continue to be available.

Irretrievable and Irreversible Commitments

Although there would be short-term structural changes to upland foraging and dispersal habitat, breeding habitat would remain largely unchanged and there are no irretrievable or irreversible commitments anticipated for the boreal toad.

Alternative 2 and 3 Determination

Implementation may result in some mortality and proposed treatments would reduce suitable upland habitat where as breeding habitat would be maintained. Based on the above analysis and the following rationale, implementation of alternatives 2 and 3 **may impact individuals or habitat, but would not likely contribute towards a trend in federal listing** for the western boreal toad.

- Potential impacts to breeding habitat would be reduced through implementation of pdfs, INFISH buffers and reduced burning intensity within riparian areas.
- Suitable habitat would be maintained or improved on sites proposed for burning treatments).
- Sixty-four to 72 percent of the project area would be unaffected by treatment.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Western boreal toad habitat would be largely unchanged under alternative 1. While the action alternatives may result in structural changes to upland foraging and dispersal habitat, the likelihood of mortality is low; breeding habitat would not be maintained, and treatments are expected to improve upland foraging habitat. All alternatives are consistent with Forest Plan (USDA Forest Service 1986) direction to provide habitat for small game, furbearers and other wildlife species (p. II/4), to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17) and to manage riparian areas to be compatible with dependent wildlife species (II-35). Also all alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Management Indicator Species

4.6.11 Northern Goshawk

Effects to goshawk habitat are based on impacts to habitat modeled according to Samson (2006) as described in Criteria for Wildlife Models Helena National Forest (USDA 2009a) and based on changes in vegetation diversity as described in Northern Goshawk Northern Region Overview: Key Findings and Project Considerations. Effects to Northern Goshawk are evaluated according to the following measures:

- Acres of foraging and nest habitat treated.
- Post-treatment home range/foraging diversity.
- Post-treatment PFA diversity

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct impacts to the northern goshawk. Designated old-growth habitat would remain largely unchanged and structural conditions such as large-diameter trees and increased levels of snags and DWD would continue to occur both in the short and long term. Mountain pine beetle mortality has and would continue to affect canopy gaps and understory development. Continued fire suppression may affect species in designated or potential old growth due to the decline in fire tolerant species.

Over the long term (greater than 20 years) stands would continue to mature, late-successional habitat would develop and stand density and goshawk nest habitat would likely increase. While the quality of goshawk foraging habitat may change due to the more closed stand conditions, because they utilize a wide range of habitat conditions for foraging (Squires and Ruggiero 1996) suitable goshawk habitat would continue to be available under this alternative.

The current trends in species composition would continue, with a decrease in ponderosa pine, early seral and fire-tolerant species and a continued increase in climax and fire-intolerant species. Insect and disease-related mortality may increase. Fuel loading and stand structure (i.e. ladder fuels) would not be modified. The risk of wildfire and a possible long-term reduction in goshawk nest habitat is greatest under this alternative.

Existing goshawk foraging and nesting habitat is displayed in figure 86 and figure 87 respectively, which can be used to compare baseline conditions with those resulting under the action alternatives.

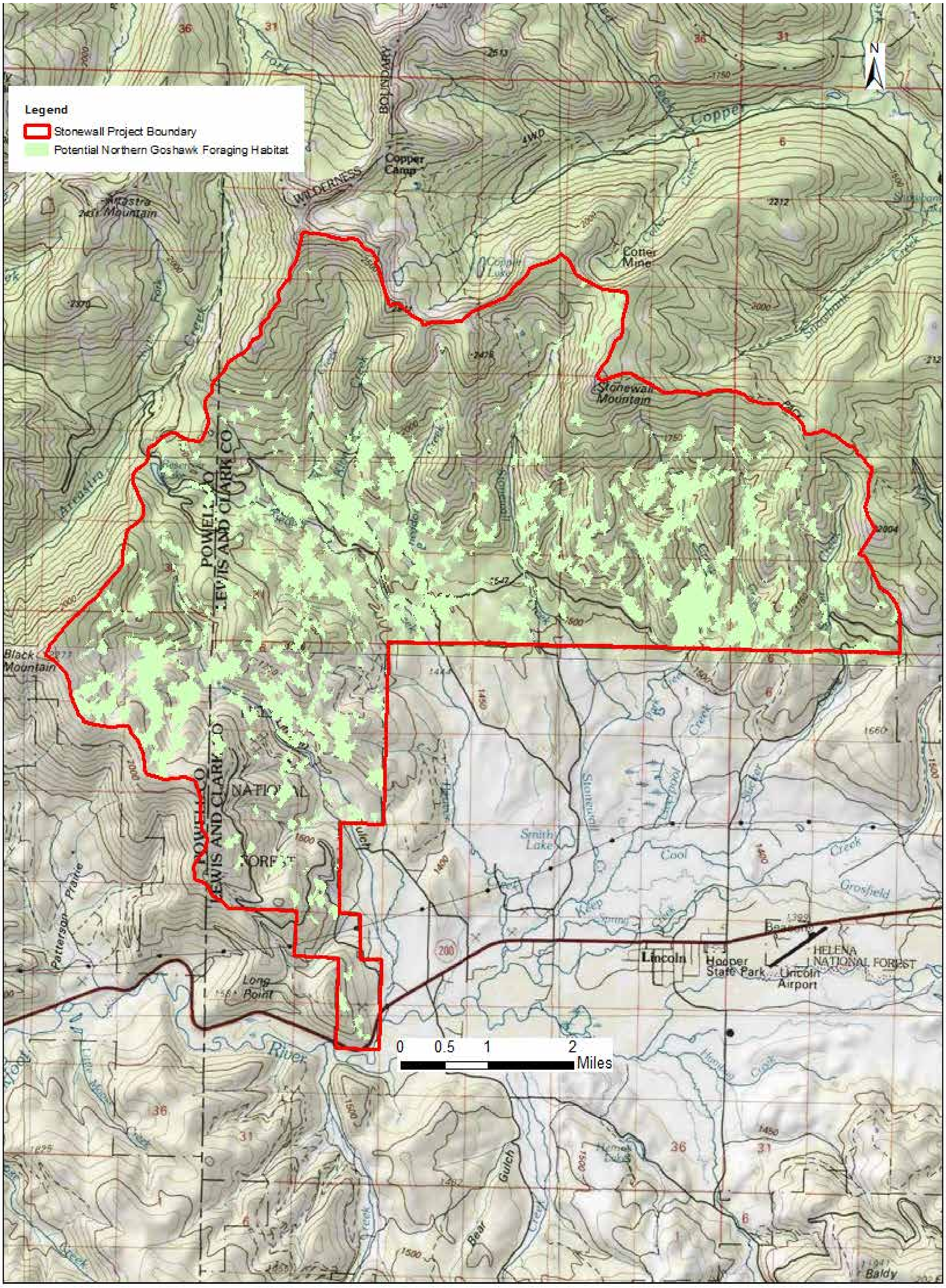


Figure 86. Existing Goshawk foraging habitat

Cumulative Effects

Anticipated cumulative effects are in volume 2, appendix C. Work such as trail maintenance and reconstruction, stream restoration, NNIS treatment and campground work would result in localized changes to habitat or occur in areas less likely to be used (e.g., along open roads and areas of concentrated human use). Disturbance from these treatments would be short term. Ongoing and future activities that could result in possible long-term effects to nesting or foraging habitat include firewood cutting, hazard tree removal, wildfire and prescribed burning. The following is a summary of these effects on goshawk.

Prescribed Burning

Effects for prescribed burning would be similar to those described under low intensity burning in section 4.3 and consist primarily of changes to understory vegetation, although some individual tree mortality may occur. Nesting habitat affected would be maintained and although there would be a short-term reduction in understory prey diversity, over the long-term understory structure and prey diversity would increase. A total of 46 and 11 acres of nesting and foraging habitat respectively would be affected.

Hazard Tree Removal

Approximately 167 acres of potential goshawk nesting habitat and 21 acres of foraging habitat were affected by hazard tree removal. Effects include short-term displacement during treatment and a long-term reduction in nest habitat. Understory vegetation would increase and prey availability would be maintained.

Recent Wildfire (since 2011)

These wildfires have affected 153 and 116 acres of nesting and foraging habitat respectively. Effects vary depending on the intensity of burning. In areas with low to moderate intensity burning (40 percent of the area burned), understory diversity would be reduced in the short term and increase over the long term. More intensively burned areas (60 percent of the area burned) would result in overstory mortality and a reduction in nesting and foraging habitat. While suitable habitat would be reduced on some of the acres affected, because the fires burned in a mosaic and considering understory diversity would increase, the area affected would continue to provide foraging and PFA habitat. Effects of past wildfire were included in the modeled habitat for this species.

Personal use Firewood Cutting

Firewood collection would reduce snags and downed woody debris along open roads. Goshawk nesting and foraging habitat would be largely unchanged because of the widespread availability of downed wood.

Conclusion

Human access and use of the area would be largely unchanged under this alternative, and there is no long-term disturbance anticipated. While ongoing and future activities would reduce goshawk nesting and foraging habitat on approximately 350 acres, nesting and foraging habitat would continue to be available within all watersheds. Also existing nests and PFA habitat would be maintained and adequate nest habitat would continue to be available to support goshawk.

Irretrievable and Irreversible Commitments

While there may be changes to vegetation structure and composition, there are no irretrievable or irreversible commitments to the northern goshawk anticipated.

Alternative 1 Determination and Conclusions

Although mountain pine beetle mortality would continue to reduce nest habitat, suitable goshawk habitat would continue to be available under this alternative. While alternative 1 would not result in direct impacts to the northern goshawk, it may result in an increased risk of catastrophic wildfire. There is no way to accurately predict when such an event would occur. Implementation of alternative 1 is not likely to cause a local or regional change in habitat quality or population status.

Action Alternatives

Designated old growth, as well as approximately 64 percent of the project area under alternative 2 and 72 percent under alternative 3 would be unaffected by treatment, and effects would be similar to alternative 1, including an increase in nest habitat and maintenance of foraging/PFA habitat.

Treatments within existing goshawk habitat are displayed by alternative in table 112, whereas alternative nest and foraging habitat conditions are displayed in table 113. The following is a discussion of effects of proposed actions on goshawk and their habitat.

Table 113. Goshawk habitat proposed for treatment

Treatment	Alternative 2				Alternative 3			
	Nest Habitat		Foraging Habitat		Nest Habitat		Foraging Habitat	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Intermediate Harvest	910	14	346	8	331	5	93	2
Regeneration Harvest	142	2	82	2	132	2	79	2
Low Severity/Jackpot Fire	143	2	156	4	651	15	532	12
Mixed Severity Fire	1,207	19	1,033	23	571	9	361	8
Total	**2,402**	**38**	**1,617**	**36**	**1,685**	**27**	**1,065**	**24**
Construction of roads that would be used and then obliterated after timber removal	1.4 mi.		1.0 mi.		0.1 mi		0.1 mi.	

Table 114. Remaining Goshawk habitat by alternative

Habitat	Alternative 1	Alternative 2		Alternative 3	
	Acres	Acres	% of Existing Habitat	Acres	% of Existing Habitat
Nest[1]	6,341	5,897	93	6,017	95
Nest over 40 acres	4,081	3,881	95	3,881	95
Foraging Habitat[1]	4,445	3,761	85	4,184	94

1 –See goshawk methodology for a description of nesting and foraging habitat.

Samson (2006a) summarized recent (2000 and newer) studies on the effects of vegetation treatments on northern goshawks that show, among others, that: (1) the majority of goshawk pairs move from nest stands when stand structure is modified by more than 30 percent (Penteriani and Faivre 2001, p. 213); (2) human disturbance is not a factor if 70 percent of the nest stand structure is maintained and timber management operations are time restricted during the nesting period (McGrath et al. 2003 as cited in

Samson 2005, p. 37); (3) timber harvest has no effect on goshawk breeding area occupancy, nest success, or productivity 1 to 2 years after treatment (Moses and Garton 2004 as cited in Samson 2006a, p. 36); and (4) no difference in the productivity of northern goshawks occurs in logged versus unlogged areas (Penteriani and Faivre 2001, p. 213).

Disturbance thresholds identified in numbers (1) and (2) above would be addressed through application of project PDF's including establishment of a 40 acre minimum no treatment zones and restricting treatments within 420 acres of active nests between April 15th and August 15th. Nest stand structure is maintained by restricting harvest and openings created through the use of mixed severity fire within 180 acres of active nests. These areas would be identified through field validation prior to and during implementation and would ensure that the goshawk family is adequately protected during courtship, egg laying, incubation, early nestling and late fledgling periods around any active nest site.

Activity timing recommendations vary among researchers. Reynolds et al (1992) in the southwestern U.S. recommend no adverse management activities in the PFA during the nesting season (March 1-September 30. Others have suggested restricting timber management operations during the breeding and fledgling periods (McGrath et al 2003, eastern Oregon). Fledging dates can vary by geographic area, elevation, or spring weather. In western Montana, Clough (2000) found a random sample of breeding goshawk began incubating eggs on May 5th, hatched June 6th, and fledged July 12th. On average then, goshawks in Clough's study were likely capable of sustained flight by August 10th, 65 days post-hatching. In northern Idaho (R1), Moser and Garton (2009) experimentally tested the impacts of clearcutting the nest area on goshawk re-occupancy rates and productivity and found that re-occupancy of the nest area was not impacted 1 to 2 years post-harvest provided harvest activities occurred after August 15th and adequate nesting habitat remained in the PFA post-treatment. Given the above, it is expected that the activity restrictions will be effective at reducing effects, although timing restrictions may be modified if site-specific conditions indicate a variation in fledgling dates.

Changes in Habitat

Existing nesting and foraging habitat and habitat that would occur under the action alternatives are displayed in table 114 and figure 87, figure 88 and figure 89. Sites proposed for regeneration harvest treatment would no longer provide goshawk nesting and foraging habitat. Harvest and openings created by mixed-severity fire would reduce nest habitat by approximately 444 acres under alternative 2 and by 324 under alternative 3. Because much of this reduction would be in small scattered parcels of nest habitat, nest habitat in blocks greater than 40 acres would be reduced by 200 acres under both alternatives.

All stands proposed for intermediate harvesttreatment would continue to provide nest habitat, whereas effects to foraging would vary by alternative. Because intermediate harvest under alternative 2 would reduce canopy closure below 40 percent, these sites would no longer be used for foraging and there would be a 15 percent reduction in foraging habitat under this alternative. Because alternative 3 was designed to reduce effects to closed canopy species, much of the proposed improvement cutting would maintain 40 percent canopy and under this alternative, 95 percent of the existing foraging habitat closure would be maintained under this alternative.

All sites proposed for intermediate harvest under both alternatives would modify understory structure, resulting in a change in prey availability. For example, the abundance of some small mammals such as red squirrels, red-backed voles and snowshoe hare have been shown to decline following partial harvest and there would be a reduction for these prey species on sites treated (USDA Forest Service 2009b, Woolf 2003), whereas chipmunks, mice and ground squirrels can be more common on sites that received thinning and burning treatments (Woolf 2003). Research suggests that despite preferences for high canopy closure, basal area, and open understories in which to hunt, goshawks tolerate a broad range of forest structures (Boal et al. 2002 in Kennedy 2003), suggesting that the diversity of conditions provided by treatment would continue to provide suitable foraging habitat.

Low-severity fire would result in open understory conditions and, like partial harvest activities, there would be a shift in prey species abundance and diversity following fire. Generally, small mammal habitat specialists such as red-backed vole, flying squirrels and shrews decrease, whereas increases occur in habitat generalists such as mice, chipmunks and ground squirrels (Zwolak and Foresman 2007, Woolf 2003). While scattered overstory mortality would occur, a mature overstory would be maintained, 20 percent of all sites would be left untreated and snags, downed woody debris and a mosaic of understory conditions would be maintained.. Consequently all sites proposed for low severity burning would continue to provide suitable nesting and foraging habitat.

There would be a reduction in nest and foraging habitat on a portion of the mixed severity sites treated where more intense burning creates canopy openings. These canopy openings would be interspersed with areas affected by low-severity burning, and unburned areas resulting in a mosaic of age classes and structural conditions. Thinning from below before prescribed fire is applied, would reduce forest fuels, while simultaneously creating stand conditions that are favorable for goshawk nesting and foraging (Reynolds et al. 1992; Squires and Kennedy 2006). Finally, goshawks occur in forests that evolved under a diversity of fire regimes including mixed severity and stand replacing events and Reynolds et al (1992) and Graham et al. (1999) have suggested that the use of controlled fire and thinning may improve habitat for goshawks by creating favorable conditions for goshawk and their prey.

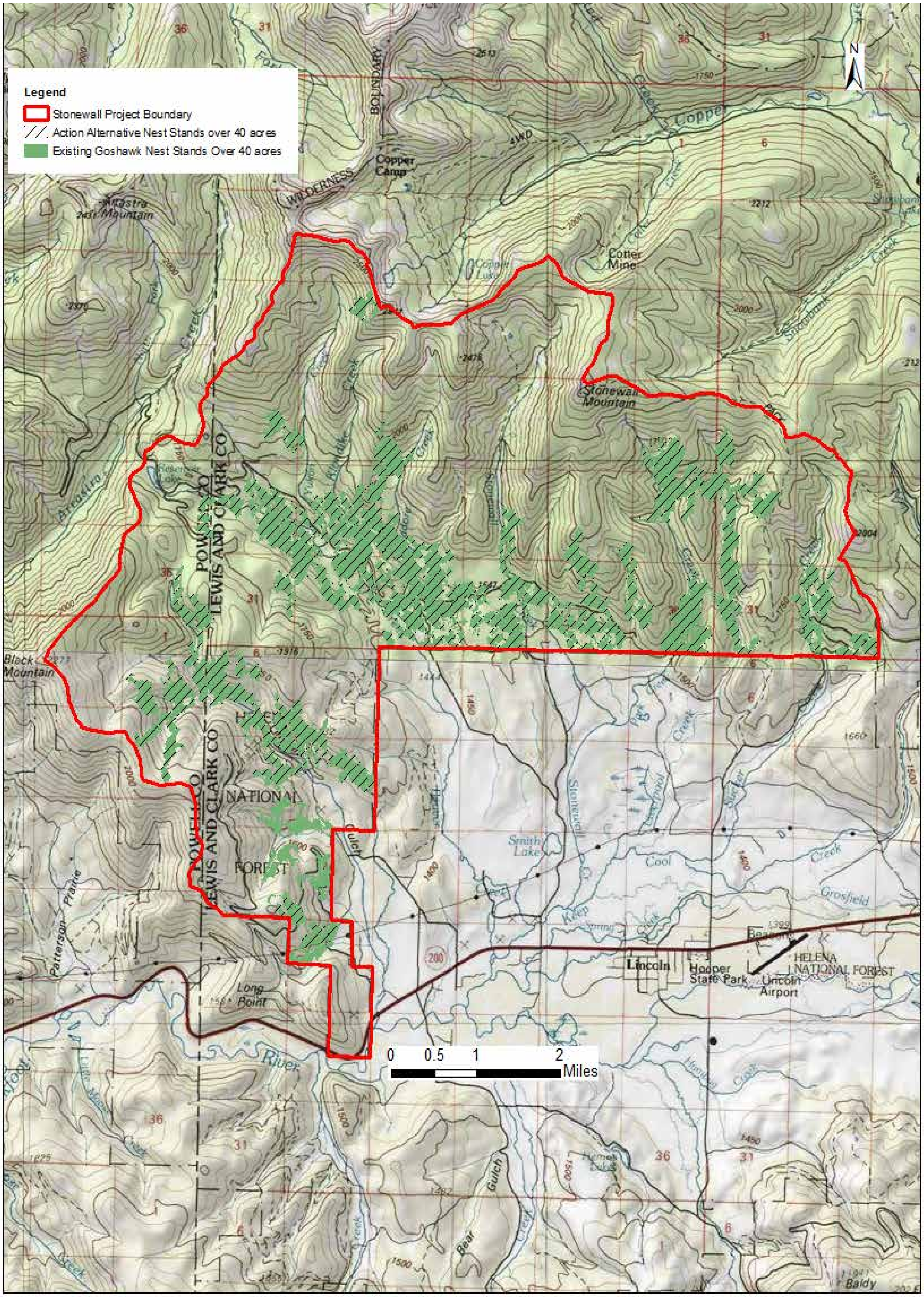


Figure 87. Existing and Post-treatment goshawk nest habitat

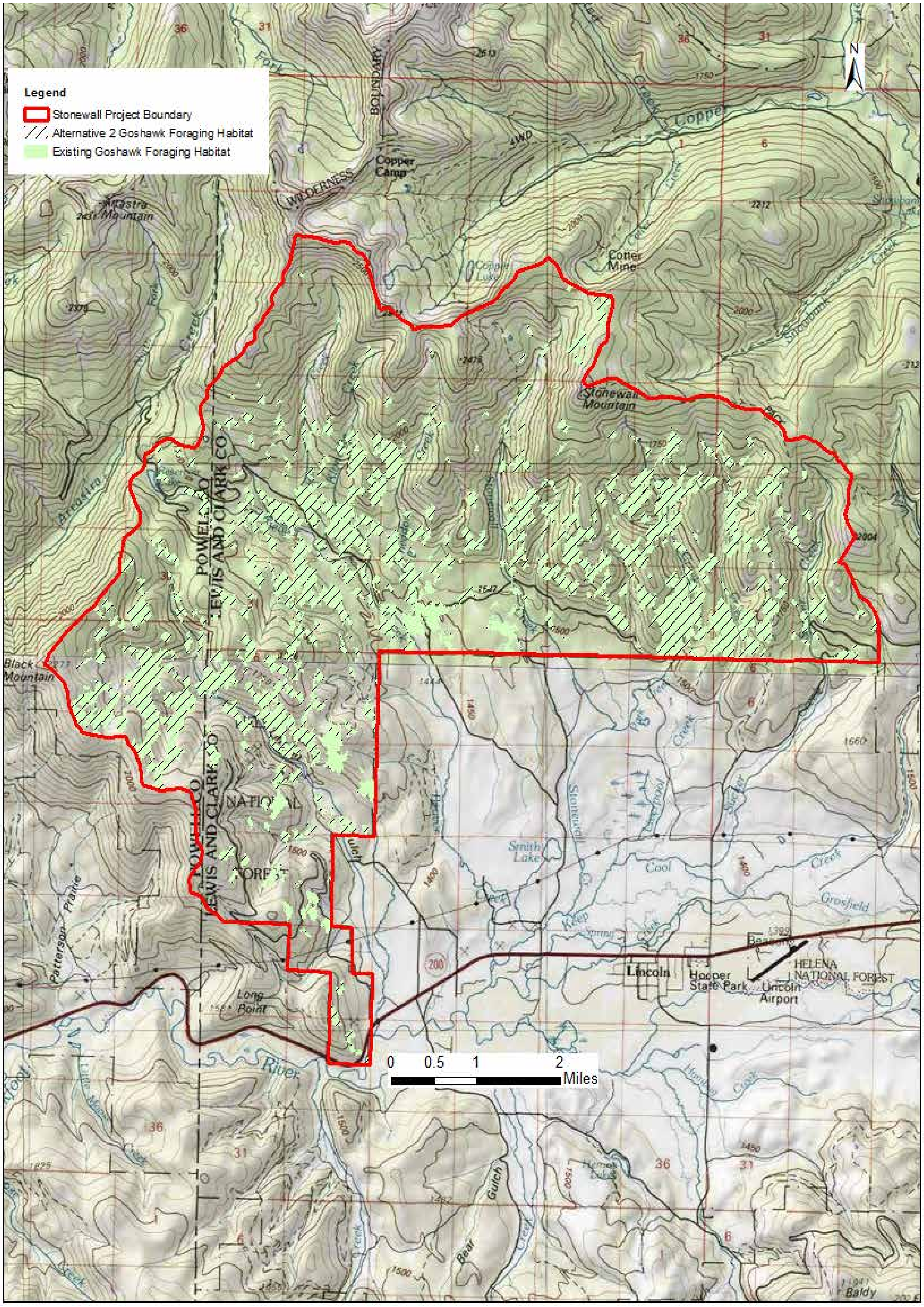


Figure 88. Existing and Alternative 2 Goshawk Foraging Habitat

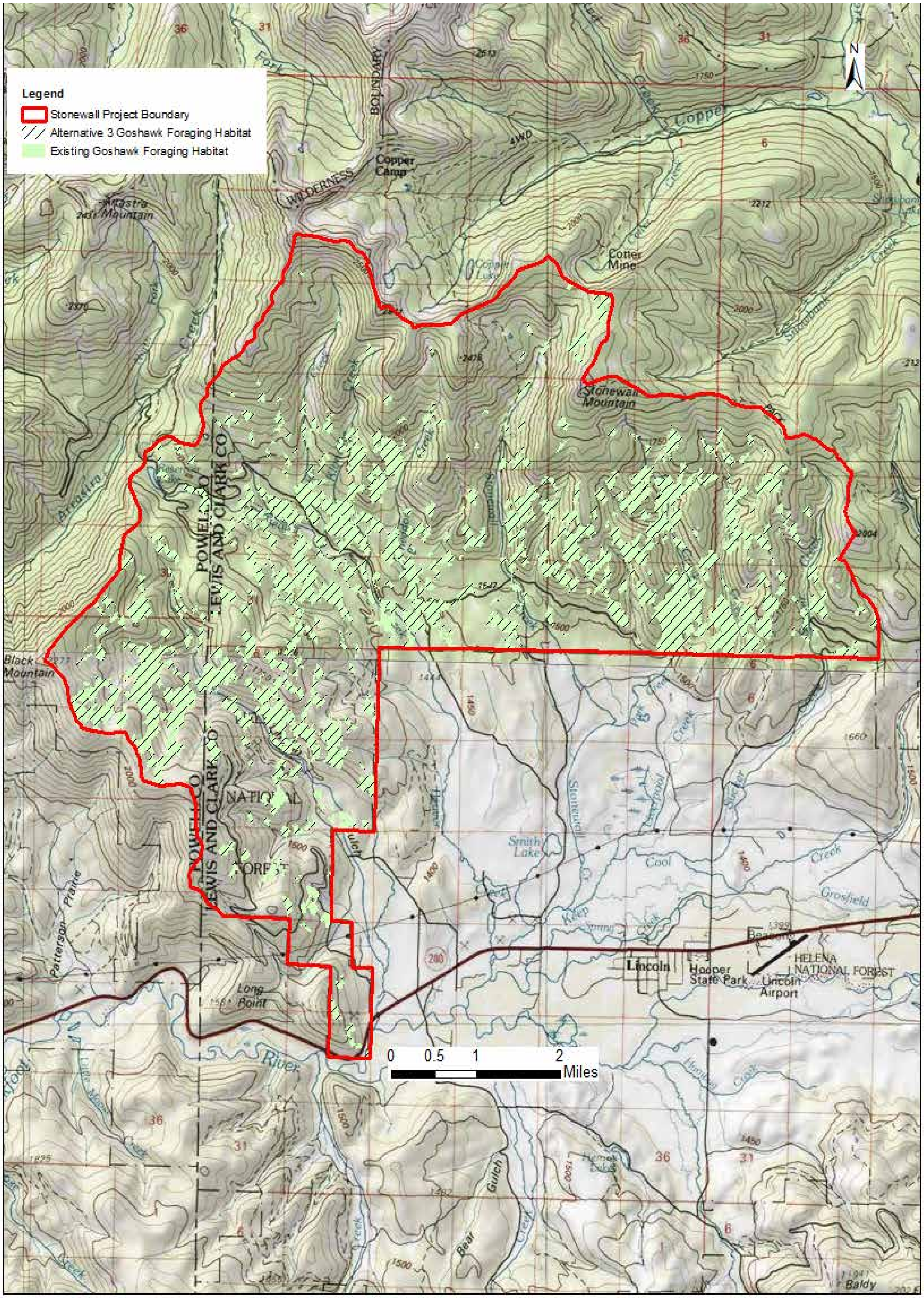


Figure 89. Existing and Alternative 3 Goshawk Foraging Habitat

Landscape Considerations

Table 114 displays landscape-level changes by alternative.

Table 115. Foraging area diversity matrix by alternative in the project area compared to research findings[2]

Size Class/Habitat Condition	Alternative 1		Alternative 2[1]		Alternative 3[1]		Reynolds (et al 1992)	Clough (2000)
	Acres	%	Acres	%	Acres	%	%	%
Seedling 0-4.9 inches d.b.h.	3,960	16	4,715	20	4,592	19	10 (0-5 inches d.b.h.)	9
Young Forest 5.9-9 inches d.b.h.	10,611	44	10,049	42	10,142	42	20 (5-12 inches d.b.h.)	66
Mature Forest >10 inches d.b.h.	8,433	35	8,241	34	8,271	34	60 (>12 inches d.b.h.)	11
Mature Forest >50% CC and >5 inches d.b.h.	4,339	18	4,262	18	4,266	18	60 (>12 inches d.b.h.)	69
Grass/Forb/Shrub	931	4	931	4	931	4	10	7

[1]Does not include openings created by mixed severity fire because they would be variable in size, distribution and canopy changes.
2 (based on R1-VMAP)

While there would be a three percent increase in seedling forest and a small decrease in mature forest, there would be little change in landscape level habitat and nesting and foraging habitat would continue to be available. Over time, as the various structural stages mature, a constant redistribution of habitats for goshawk and their prey may occur, which would help provide a long-term, sustainable mix of forest age classes and help ensure that goshawk habitat is maintained (Reynolds et al. 1992). While there would be small change in seedling/mature forest under the action alternatives, there would be little change in the distribution of available habitat and both alternatives would continue to provide landscape level habitat consistent with goshawk use. Also habitat would continue to be available to support three to four nesting pairs.

Post-fledgling Habitat

Post-fledgling habitat is analyzed for the Stonewall east and Stonewall west post-fledging areas (PFA) according to the guidelines identified in the Northern Goshawk Northern Region Overview: Key findings and project Considerations (USDA Forest Service 2009c). Table 115 displays treatments proposed under each of the action alternatives in the Stonewall East and Stonewall West PFA, whereas table 116 and table 117 display habitat conditions within the respective PFAs. For comparison, habitat conditions for alternative 1 are displayed also.

Table 116. Active nest PFA habitat treated

Size Class/Habitat Condition	Stonewall East				Stonewall West			
	Alternative 2		Alternative 3		Alternative 2		Alternative 3	
	Acres	%	Acres	%	Acres	%	Acres	%
Prescribed Fire	126	30	126	30	0	0	0	0
Intermediate Harvest	0	0	0	0	8	2	8	2
Regeneration Harvest	12	3	12	3	20	5	20	5

Table 117. Stonewall east PFA diversity matrix for habitat analysis by alternative[1]

Size Class/Habitat Condition	Alternative 1		Alternative 2[1]		Alternative 3[1]		Reynolds (et al. 1992)	Clough (2000)
	Ac	%	Ac	%	Ac	%	%	%
Seedling 0-4.9 inches d.b.h.	78	19	106	25	106	25	10 (0-5 inches d.b.h.)	9
Young Forest 5.9-9 inches d.b.h.	223	53	202	49	202	49	20 (5-12 inches d.b.h.)	66
Mature Forest >10 inches d.b.h.	118	28	111	26	111	26	60 (>12 inches d.b.h.)	11
Mature Forest >50% CC and >5 inches d.b.h.	99	24	80	19	80	19	60 (>12 inches d.b.h.)	69
Grass/Forb/Shrub	1	0	0	0	0	0	10	7

[1] (based on R1-VMAP)

Table 118. Stonewall west PFA diversity matrix for habitat analysis by alternative[1]

Size Class/Habitat Condition	Alternative 1		Alternative 2		Alternative 3		Reynolds (et al 1992)	Clough (2000)
	Ac	%	Ac	%	Ac	%	%	%
Seedling 0-4.9 inches d.b.h.	52	12	66	16	66	16	10 (0-5 inches d.b.h.)	9
Young Forest 5.9-9 inches d.b.h.	156	37	201	48	201	48	20 (5-12 inches d.b.h.)	66
Mature Forest >10 inches d.b.h.	212	51	153	36	153	36	60 (>12 inches d.b.h.)	11
Mature Forest >50% CC and >5 inches d.b.h.	132	31	130	31	130	31	60 (>12 inches d.b.h.)	69
Grass/Forb/Shrub	0	0	0	0	0	0	10	7

[1] (based on R1-VMAP)

Currently, neither of the existing PFAs meet the recommended amount of habitat within any category and the relatively small amount of closed canopy forest within both PFA's is due to recent MPB mortality. Effects under the action alternatives include reduction in mature and young forest due to proposed regeneration harvest and openings created by mixed severity burning. While the action alternatives would reduce young and mature forest by 28 acres and 14 acres in the Stonewall East and West PFAs respectively, treatments would increase understory diversity and composition , pdfs would maintain mature forest within 180 acres of the nest sites, and over time, the action alternatives would result in a diverse mix of forest age classes and structure that would provide both cover and prey for immature and adult birds. These changes are aligned with certain desired PFA conditions described by Reynolds et al. (1992, pp. 22-24) that include the following:

- Provide hiding cover for fledglings
- Provide habitat for prey and foraging opportunities for adults and fledgling goshawks during the fledgling-dependency phase
- Provide snags and down woody debris
- Minimize disturbance during the fledgling-dependency period by restricting activities during this time
- Treatments in the early seral stages should result in lower basal area to promote tree growth
- Treatments in the older seral stages should promote irregular spacing
- Road densities should be managed to minimize disturbance

Competition

The extent to which species co-exist with goshawks and likelihood of competition with other raptors depend on the openness of the habitat (USDI Fish and Wildlife Service 1998). Natural and man-made changes that result in reduced forest canopy may favor the habitat needs of more open-forested competitors, such as red-tailed hawks, thereby decreasing the amount of habitat available to goshawks (ibid). The nest site selected by these two species varies, with goshawk selecting continuous mature forest with open understories, whereas red-tail nesting territories are often comprised of large open patches with dense understories and scattered trees (La Sorte et al. 2004 in USDA Forest Service 2009c). Whether some threshold level of fragmentation exists, beyond which red-tailed hawks completely replace goshawks is unknown and to date no scientific studies have conclusively documented such a replacement. Reynolds et al. (1992) recommend vegetation management treatments that maintain habitat at a home range scale to sustain goshawks across landscapes.

While proposed regeneration harvest would reduce mature forest on approximately 4 percent of the project area, treatment would occur in stands that have already experienced concentrated MPB mortality. Also openings created by mixe- severity fire would be scattered, largely surrounded by closed canopy forest, and create conditions similar to those that occurred historically. Consequently the mature forest conditions that characterize the project area would be maintained under conditions that would further promote use of the area by red-tailed hawks or other competitors.

Cumulative Effects

Effects of past, ongoing and future activities would be similar to those described under alternative 1. While most activities would result in short-term effects with little change in goshawk habitat, anticipated activities would reduce goshawk nesting and foraging habitat on 259 and 91 acres respectively due to hazard tree removal and wildfire. In addition to these effects, future activities would affect up to another 2,402 acres (alternative 2) of nest habitat and 1,617 acres of foraging habitat, including a 200-acre reduction in nest habitat greater than 40 acres in size, and a 684-acre reduction in foraging habitat.

Cumulatively during the analysis period, up to 2,768 acres (15 percent) of the nest habitat and 1,765 acres (18 percent) of foraging habitat would be affected, whereas approximately 80 percent of the existing nesting and foraging habitat would be unaffected. While the amount and distribution of habitat would change, remaining habitat would continue to occur within all affected watersheds and adequate habitat would continue to exist to support three to four nesting pairs of goshawk.

Irretrievable and Irreversible Commitments

There are no irreversible commitments anticipated. Irretrievable commitments include a reduction in nest habitat, and altered structure and quality of foraging habitat (described above), although habitat conditions would be restored on all sites treated.

Alternative 2 and 3 Determination

Desirable northern goshawk habitat conditions include providing between 180 and 240 acres of nesting habitat per a 5,000-acre territory, heterogeneous foraging habitat including mature forest as well as a mix of other forest and non-forest components, and approximately 420 acres of post-fledgling habitat that includes some mid to later seral forests with structural diversity in the understory. While mplementation of the action alternatives would reduce existing nesting and foraging habitat these desired conditions would continue to occur under both action alternatives, and based on the above analysis and the following rationale, implementation of alternatives 2 and 3 **is not likely to cause a local or regional change in habitat quality or population status**.

- ♦ Implementation of pdfs and and maintenance of active nest site structural conditions will minimize the likelihood that nesting birds or their young would be affected.
- ♦ Approximately 95 percent of the project area nest habitat in patches of greater than 40 acres would be maintained. Also, habitat would continue to be well-distributed and adequate habitat would be maintained to support up to four nesting pairs of goshawks.
- ♦ Implementation of treatments may reduce the risk of stand-replacing wildfire and a possible long-term loss of goshawk habitat.

A Regionwide assessment (Samson 2006b, USDA Forest Service 2009c) of goshawk habitat has indicated the following:

- ♦ Goshawk habitat in Region 1 (R1) is abundant and well distributed where it occurs naturally; more forest and therefore nesting habitat exists on today’s landscape than occurred historically.
- ♦ There have been substantial increases in connectivity for forested habitat since Euro-American settlement.
- ♦ The level of timber harvest of the forested landscape in R1 is insignificant in regard to altering goshawk habitat at the population scale.
- ♦ Not a single known nest in R1 is isolated from other known nests by more than the goshawk’s estimated dispersal distance.
- ♦ A comparison of habitat estimates for maintaining viable populations indicates that given the natural distribution of habitat, each Forest in R1 has an excess of available goshawk habitat.
- ♦ Below (and not above) a threshold of 20 to 30 percent of historical habitat amounts, the effects of fragmentation (i.e. patch size and isolation) are suggested to have a negative impact on species persistence. No indication exists that forested ecosystems in Region 1 have reached the 20 to 30 percent threshold.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Goshawk habitat would be largely unchanged under alternative 1. While the action alternatives would reduce suitable habitat, there are no impacts to nesting birds or reproduction anticipated. Over 85 percent of the existing nesting and foraging habitat would be maintained, post-fledgling habitat associated with existing nests would be maintained, long-term human access would not be increased, designated old growth would not be treated, and treatments would reduce the risk of stand-replacing wildfire and a possible long-term reduction in nest habitat. As a result, all alternatives are consistent with Forest Plan (USDA Forest Service 1986) direction to provide habitat for small game, furbearers and other wildlife species (p. II/4), to develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs (p. II/2), to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17) and to manage 5 percent of each 3rd order drainage for old growth (p. II/20). Also all alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12 and Forest Plan standards related to snags and downed woody debris.

Pileated Woodpecker

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct effects to the pileated woodpecker. Effects on old-growth structure and composition would be the same as described under northern goshawk and old growth structure would be maintained in designated and potential old growth.

As described under the affected environment, due to decades of overstocking and widespread MPB mortality, snags and coarse woody debris have increased and are available across the landscape. Changes in pileated woodpecker habitat on lands affected by mortality will be variable. Continued mortality will increase available snags in all size classes and downed wood for the next 10 to 20 years and improve habitat on many sites, whereas habitat quality may be reduced in areas of concentrated mortality due to canopy cover changes. While levels of down wood and small to medium diameter snags will remain high, because of increased mortality of large ponderosa pine and reduced ponderosa pine recruitment due to establishment of dense Douglas-fir understoriestrees, the availability of large ponderosa pine snags and preferred pileated woodpecker nest trees will decline over time.

In the absence of fire, late-successional forest conditions, including elevated levels of snags and DWD would continue to develop across the project area, and pileated woodpecker foraging habitat would increase. Because of continued fire suppression and increases in fuel loading, the risk of large-scale wildfire is highest under this alternative.

Cumulative Effects

Cumulative effects to the pileated woodpecker are evaluated across the combined boundary, as this area is large enough to evaluate landscape level effects and includes lands recently affected by wildfire. Past, ongoing and future cumulative effects are in volume 2, appendix C. Of the anticipated activities, trail construction (58 acres of suitable habitat affected), stream restoration work (8 acres of affected habitat) and campground use (2 acres of habitat) would result in small localized changes in habitat and short-term disturbance during treatment. Because of small changes to the overstory and future snag recruitment, overall nesting and foraging habitat would be maintained. Ongoing and future activities that could affect the availability of suitable habitat include prescribed burning, hazard tree removal, wildfire, off-forest harvest and firewood collection. The following is a summary of effects to the pileated woodpecker.

Prescribed burns

Prescribed burning would occur on 103 acres. Effects would consist primarily of changes to understory vegetation, although some individual tree mortality may occur. There would be localized reductions in canopy cover and an increase in primarily small diameter snags. While stands would continue to provide suitable habitat, because treatment would reduce downed wood and substrate for ants, on which pileated woodpeckers primarily forage, the quality of foraging habitat would be reduced on the acreage burned (Bull et al. 2005).

Hazard tree removal

Approximately 250 acres of pileated woodpecker habitat would be affected by hazard tree removal. Effects include a reduction in snags and DWD on the acreage treated. Although, forest-plan levels of snags are being retained.

Recent wildfire

These wildfires have affected 219 acres of suitable pileated woodpecker habitat. Effects vary depending on the intensity of burning. In areas with low to moderate intensity burning (approximately 40 percent of the acres burned), understory diversity would be reduced. More intensively burned areas (60 percent of the acres burned) would result in overstory mortality and a reduction in nesting and foraging habitat on approximately 130 acres. Areas that burned with moderate intensity would result in pockets of reduced canopy cover, as well as an increase in snags (including large diameter). Effects of past wildfire are included in the modeled habitat for this species.

Off-forest timber harvest

Off-forest timber harvest would occur on 75 acres of existing habitat. While the type of harvest may vary, it is assumed that pileated woodpecker habitat would be reduced on this acreage.

Personal use firewood cutting

Firewood collection would reduce snags and downed woody debris along roads, reducing snag availability for this species.

Conclusions

Cumulatively a total of approximately 715 acres of pileated woodpecker habitat would be affected, including a reduction in habitat on 455 acres. Snag recruitment would increase due to ongoing MPB mortality, over 95 percent of the available habitat would be unaffected, and suitable pileated woodpecker nesting and foraging habitat would continue to be available.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated. While habitat would continue to be widespread, the long-term reduction in large-diameter ponderosa pine snags that would occur under this alternative is considered an irretrievable commitment.

Alternative 1 Determination

Under alternative 1 suitable pileated woodpecker habitat would be maintained and snag availability would increase for the next 10 to 20 years. While the availability of future large diameter snags would be reduced over time, implementation of alternative 1 is **not likely to cause a local or regional change in habitat quality or population status** for the pileated woodpecker.

Alternatives 2 and 3

There are no treatments proposed in Forest Plan designated old-growth habitat under the action alternatives and preferred stand structure will continue to occur in designated and potential old growth.

Table 118 displays project area treatments proposed under the action alternatives.

Table 119. Alternative treatments within pileated and hairy woodpecker habitat[1]

Treatments	Alternative 2		Alternative 3	
	Acres	Percent	Acres	Percent
Intermediate Harvest	1,077	14	427	6
Regeneration Harvest	184	2	162	2
Low Severity Fire	182	2	611	8
Mixed Severity Fire	1,407	18	758	10
Jackpot Burn	0	0	124	2
Total within treatment units	2,850	36	2,082	26
Total unaffected habitat[2]	5,247	67	6,018	77

[1]-because there is only a 17 acres difference in pileated and hairy woodpecker habitat and this acreage is outside any treatment area, the affected habitat for these two species is discussed collectively.

[2]-includes unburned land withing prescribed burning units

Direct and Indirect Effects

While this species is usually tolerant of human activity near the nest, disturbance from treatment may cause roosting or foraging birds to on a site may move out of the area (Birds of North America 2011) or nesting could be affected if a nest tree is removed. With retention of large diameter snags in all units unless they pose a safety threat, increased availability of large snags and lower population density on the HNF and eastside forests, the likelihood that nesting birds would be affected is low. Unaffected habitat would continue to be available to accommodate any temporarily displaced birds.

Due to the reduction in canopy and considering the pileated woodpecker is not normally associated with moderately to severe burned forests, (Wightman and Saab 2008), proposed regeneration harvest and openings created by mixed -severity fire would no longer provide suitable pileated woodpecker habitat.

While sites proposed for intermediate harvest would continue to provide suitable habitat, because treatment would reduce the live overstory, snags and downed wood, the quality of nest and foraging habitat and likely use of these sites would be reduced. Similarly due to the reduction in downed wood, pileated woodpecker foraging would be reduced in lands affected by underburning (Bull et al. 2005), although the mosaic of burned and unburned lands resulting from treatment would continue to provide nesting and foraging habitat.

In upland habitats in the Northern Rockies, pileated woodpeckers nest almost exclusively in large-diameter ponderosa pine and western larch snags (Hills et al. 2001; McClellan and McClellan 1999). Treatments proposed under the action alternatives promote the long-term sustainability of both species while maintaining diversity of structural conditions including large-diameter snags, and more open grown ponderosa pine. Consequently over the long term suitable pileated woodpecker habitat is expected to be maintained or improved on sites affected by treatments.

Alternative 2

Sixty-four percent of the project area would not be treated and effects on untreated areas would be the same as alternative 1. There would be a long-term reduction in nesting and foraging habitat, on up to 542 acres, due to proposed regeneration harvest and openings created by mixed-severity burning, whereas habitat quality would be reduced on 2,035 acres affected by low-severity burning and intermediate harvest.

Approximately 5,700 acres that currently do not provide suitable pileated woodpecker habitat are proposed for treatment. Activities are designed to restore open-grown ponderosa pine habitat and promote sustainability of large-diameter ponderosa pine and western larch, and it is expected that pileated woodpecker habitat would be improved over the long term on this acreage.

Alternative 3

Alternative 3 proposes fewer harvest and mixed-severity fire treatments, so the likelihood of direct effects are reduced and 77 percent of the existing habitat would be unaffected. Effects on these lands would be the same as those described under alternative 1. Approximately 1,806 acres of existing habitat would be affected by treatment. Effects include a long-term reduction in habitat on 352 acres due to harvest and fire created openings, whereas habitat quality would be reduced on 1,455 acres.

Approximately 4,500 acres that currently do not provide suitable pileated woodpecker habitat would be treated. Like alternative 2, because treatments are designed to restore open grown ponderosa pine habitat and promote sustainability of large-diameter ponderosa pine and western larch, it is expected that over time, pileated woodpecker habitat would be improved these lands.

Alternatives 2 and 3

Cumulative Effects

Past, ongoing and future activities are discussed under alternative 1 and a total 715 acres of suitable habitat would be affected, including a reduction in suitable habitat on 455 acres. In addition to effects described under alternative 1, future activities would affect up to another 2,855 acres of pileated woodpecker habitat (alternative 2). Of this, low quality foraging and nest habitat would be created on 2,035 acres proposed for intermediate harvest and low severity burning, where as nesting and foraging habitat would be reduced on 542 acres due to regeneration harvest and opening created by mixed severity fire.

Cumulatively during the analysis period, up to 3,500 acres of the existing pileated woodpecker habitat would be affected by some activity. Of this, there would be a long-term reduction in nesting and foraging habitat on almost 1,000 acres due to regeneration harvest, openings created by mixed-severity burning, hazard tree removal, high intensity wildfire and off-forest harvest.

While pileated woodpecker nesting and foraging habitat would be affected on up to approximately 3,500 acres of the existing habitat within the analysis area would be affected by on-going and future activities, considering that snags, and downed wood would be abundant across the landscape (see dead wood section), and that approximately 85 percent of the existing habitat would be unaffected by treatment, suitable pileated woodpecker habitat would continue to be available to support local populations and use.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated. Irretrievable commitments include a reduction in nest habitat and altered structure and quality of foraging habitat, although habitat conditions would be restored over time. Like alternative 1, future reduction in large ponderosa pine snags would occur on untreated lands.

Alternative 2 and 3 Determination

The action alternatives would affect up to 2,577 acres of existing pileated woodpecker habitat. Suitable habitat would continue to be available within all affected watersheds, and proposed treatments would maintain or improve pileated woodpecker habitat over the long term. Based on the above analysis and the following rationale, implementation of alternatives 2 or 3 are **not likely to cause a local or regional change in habitat quality or population status** for the pileated woodpecker.

- Both alternatives would maintain suitable pileated woodpecker habitat across the landscape, while providing for the long-term sustainability of large-diameter snags.
- No designated old-growth habitat would be affected.
- The risk of large stand-replacing wildfire would be reduced.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Suitable habitat would be maintained in the short term under alternative 1 and reduced under alternatives 2 and 3. The likelihood of mortality is low under the action alternatives and suitable habitat would continue to be available across the landscape under all alternatives. No designated old growth would be affected, and the risk of stand-replacing wildfire would be reduced. All alternatives meet Forest Plan (USDA Forest Service 1986) direction to provide habitat for small game, furbearers and other wildlife species (p. II/4), to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17) and to manage 5 percent of each 3rd order drainage for old growth (p. II/20). Also all alternatives are consistent with Forest Plan (p. II/20 to II-21) snag management guidelines (USDA Forest Service 2000a) and with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Hairy Woodpecker

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct effects to the hairy woodpecker. Indirect effects would be similar to the pileated woodpecker and small- to medium-diameter snags as well as DWD would increase over the short and long-term. Large snags would increase for the next 10 to 20 years, then decline over time. Suitable hairy woodpecker foraging and nesting habitat would continue to increase under this alternative. Due to continued fire suppression and increases in fuel loading, the risk of large scale wildfire is highest under this alternative.

Cumulative Effects

Anticipated cumulative effects are the same as those described under alternative 1 for the pileated woodpecker. Cumulatively during the analysis period a total of approximately 715 acres of hairy woodpecker habitat would be affected, including a reduction in habitat on approximately 455 acres. Snag recruitment would increase due to ongoing MPB mortality, over 90 percent of the available habitat would be unaffected, and suitable hairy woodpecker habitat would be maintained.

Action Alternatives

Treatments proposed under each of the alternatives within suitable hairy woodpecker habitat are displayed in table 128, under the pileated woodpecker analysis.

Direct and Indirect Effects

Because both woodpecker species utilize snags and DWD, anticipated direct effects would be similar to those described for the pileated woodpecker and possible mortality during treatment.

Suitable habitat would be reduced under both action alternatives on the acreage proposed for harvest and prescribed burning due to removal of snags and DWD on the sites treated, although, habitat for the hairy woodpecker would be maintained on site. For example, Bunnell et al. (2002) found that partial harvest activities did not affect the abundance of primary cavity nesters in most cases, and in some cases the abundance of species such as the hairy woodpecker increased due to small openings and creation of edges. In a study of dry forests in Washington, Lyon et al. (2008) found thinning and low-severity burning may enhance foraging habitat for bark gleaning species as a whole. Implementation of pdfs that retain snags and down wood suitable hairy woodpecker habitat would be maintained on sites affected by intermediate harvest treatments and low-severity burning.

Like the pileated woodpecker, regeneration treatments and openings created by mixed-severity burning would reduce suitable hairy woodpecker habitat.

Covert (2003) looked at the effect of mixed-severity wildfire on hairy woodpecker foraging in ponderosa pine in northern Arizona. His results indicate that hairy woodpecker relative abundance was greatest in high-severity burns relative to moderate-severity burns and unburned areas, although this preference decreased as burns age. Hairy woodpeckers selected trees and patches with greater tree bole scorch when available. Further, a number of authors suggest that major declines in forest dwelling birds, especially woodpeckers, results from fire suppression (Hutto 1995; Hobson and Sheik 1999, Brawn et al. 2001 *in* Covert 2003). Covert (2003) also suggests that high-severity burns may be important for resident bark-foraging birds as they provide high concentrations of over-winter prey resources. While pockets of treated areas may become unsuitable, over the long term, it is expected that restoration of historic levels of fire using both mixed- and low-intensity burning would result in the long-term improvement of hairy woodpecker habitat.

Alternative 2

Sixty-four percent of the project area would not be treated, and effects on untreated areas would be the same as alternative 1. While pdfs would retain snags and suitable hairy woodpecker habitat on harvest sites and burning would create additional snags, effects of treatment include a reduction in snags and nesting habitat on the acres affected. Effects from intermediate harvest and prescribed burning would reduce snags and DWD on 2,035 acres. Regeneration harvest and openings created by mixed-severity burns may result in long-term reductions in nesting and foraging habitat on up to 542 acres. Over time treatments would improve structural diversity on treated sites, promote development of large-diameter snags and create a mosaic of habitat conditions.

Alternative 3

Seventy-two percent of the project area would not be treated, and effects on untreated areas would be the same as alternative 1. Effects from intermediate harvest and low severity burning include a reduction in snags and DWD on 1,455 acres. Additionally, there may be a long-term reduction in nesting and foraging habitat on up to 352 acres from regeneration harvest and openings created by mixed-severity burns. Like alternative 2 over time treatments would improve structural diversity on treated sites, promote development of large-diameter snags and create a mosaic of habitat conditions.

Cumulative Effects

Past, ongoing and future activities are discussed under alternative 1 for the pileated woodpecker and cumulatively during the analysis period, up to approximately 3,570 acres (alternative 2) of the existing hairy woodpecker habitat would be affected by some activity, including a reduction in suitable habitat on almost 1,000 acres due to regeneration harvest, openings created by mixed severity burning, recent hazard tree removal, high intensity wildfire and off-forest harvest.

While hairy woodpecker nesting and foraging habitat would be affected on up to 3,570 acres, considering that snags would be abundant across the landscape (see dead wood section), and that over 85 percent of the existing habitat would be unaffected, suitable hairy woodpecker habitat would continue to be available to support local populations and use.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated. Irretrievable commitments include a reduction in nesting habitat, and altered structure and quality of foraging habitat, although habitat conditions would be restored on all sites treated.

Alternative 2 and 3 Determination

The action alternatives would affect up to 2,577 acres of existing hairy woodpecker habitat. Suitable habitat would continue to be available within all affected watersheds, and proposed treatments would maintain or improve hairy woodpecker habitat over the long term. Based on the above analysis and the following rationale, implementation of alternatives 2 or 3 are **not likely to cause a local or regional change in habitat quality or population status** for the hairy woodpecker.

- Over 90 percent of the existing habitat would be maintained.
- Over the long term, treatment would promote stand and landscape diversity and maintain or improve hairy woodpecker habitat across the landscape, while providing for the long-term sustainability of preferred nesting and foraging habitat.
- The risk of large stand-replacing wildfire would be reduced.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Suitable habitat would be maintained in the short term under alternative 1 and reduced under alternatives 2 and 3. The likelihood of mortality is low under both action alternatives. Abundant suitable habitat would continue to be available; habitat would be improved over time and the risk of stand-replacing wildfire would be reduced. All alternatives meet Forest Plan (USDA Forest Service 1986) direction to provide habitat for small game, furbearers and other wildlife species (p. II/4), and to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17) . All alternatives are consistent with Forest Plan direction (p. II/20 to II-21and with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

American Marten

Alternative 1

Direct and Indirect Effects

There are no treatments proposed under this alternative, so there would be no direct effects to the American marten. Marten utilize closed-canopy forests with large amounts of snags and DWD and large-diameter trees, all of which have been modified by recent MPB infestation. While the project area may continue to develop late-successional forest conditions and have an abundance of DWD, canopy mortality has reduced suitable marten habitat. Some stands contain predominantly closed forest conditions with large amounts of DWD and provide suitable marten habitat, whereas stands with more open-canopy conditions provide marginal or unsuitable habitat. While the project area does not provide the closed-canopy landscape conditions preferred by marten (Powell et al 2003), the availability of snags and downed wood and understory structural conditions preferred by marten will continue to increase. Due to continued fire suppression and increased fuel loading, the risk of large-scale wildfire is highest under this alternative.

Cumulative Effects

Past, ongoing and future cumulative effects are in volume 2, appendix C. While all activities could result in short-term disturbance during treatment, grazing, and NNIS treatment would not affect marten habitat. Stream restoration and trail work would affect approximately 50 acres, so suitable marten habitat would remain largely unchanged. Ongoing and future activities that could affect marten habitat that could result in long-term changes in habitat include:

Prescribed fire

A total of 62 acres of low-intensity prescribed fire would occur within suitable marten habitat. Effects would be similar to those described in section 4.3 for low-intensity burning and include a reduction of smaller diameter downed wood and some individual tree mortality. Overall effects to habitat would be short term (less than10 years) and suitable habitat would be maintained.

Off-forest harvest

A total of 69 acres of off-forest harvest would occur between the project area boundary and Highway 200. While the type of harvest is not known, it is assumed that treatment would reduce marten habitat over the long-term.

Hazard tree removal

While some snags would be retained, due to the reduction in snags and future downed wood, it is assumed that marten habitat would be reduced on 169 acres of suitable marten habitat affected by hazard tree removal treatment.

Recent wildfire

Since 2011, a total 183 acres of suitable marten habitat have been affected by wildfire. Effects vary depending on the intensity of burning. Intensively burned areas (60 percent of the acres burned) would result in mortality on much of the overstory, which would reduce marten habitat on approximately 110 acres. Areas that burned with low to moderate intensity would result in pockets of reduced canopy cover, as well as an increase in snags (including large diameter.

Firewood collection

Firewood collection would generally occur within 100 ft. of open roads and would result in a long-term reduction in large-diameter downed wood along these road corridors, although overstory conditions would be unchanged.

Conclusions

Collectively, approximately 500 acres of suitable marten habitat would be affected. Effects include a reduction quality on all of the affected acres, as well as along open road corridors affected by firewood collection and a long-term reduction in habitat on approximately 350 acres. Approximately 95 percent of the existing habitat would be unaffected.

Alternative 1 Determination

While alternative 1 may increase the risk of catastrophic wildfire, American marten habitat would be largely unchanged in the short and long term, and implementation is **not likely to cause a local or regional change in habitat quality or population status** for this species.

Action Alternatives

Proposed treatment could result in harm or disturbance to marten during treatment. The likelihood that an animal would be directly affected is low when you consider the project area does not provide landscape conditions preferred by marten, and that marten are largely restricted to higher elevations with deep snow (Ruggiero et al. 1994), whereas most of the treatment sites occur at lower elevations with less snowpack. Between 68 and 80 percent of the existing habitat would be unaffected, and suitable habitat would continue to be available to accommodate any temporarily displaced animals.

Timber harvest would alter marten habitat, although effects would vary by treatment. Intermediate harvest would reduce habitat quality because of reduced stand structure and canopy, although stands would retain some features of marten habitat such as requisite canopy cover (i.e., greater than 25 percent), stand size, snags and downed woody debris. Due to the reduction in canopy cover, as well as reduced stand structure marten habitat would be reduced over the long-term on sites affected by regeneration harvest or in fire created openings. Effects of fire would also vary and marten habitat would be reduced on lands affected by high severity fire, whereas structure and habitat quality would be reduced by low severity fire. Because prescribed burn lands would provide a mosaic of burned and unburned lands, suitable marten habitat would continue to be available within burn units

Table 119 displays existing American marten habitat proposed for treatment under the action alternatives, where as these treatments by alternative are summarized in table 120.

Table 120. Alternative treatments in American marten habitat

Treatments	Alternative 2		Alternative 3	
	Acres	Percent[1]	Acres	Percent[1]
Intermediate Harvest	914	13	335	5
Regeneration Harvest	143	2	133	2
Low Severity Fire	152	2	531	8
Mixed Severity Fire	1,265	19	598	9
Total	**2,474**	**36**	**1,597**	**24**

[1]-Percent of available habitat

Table 121. Post-treatment effects to marten habitat by alternative

Treatments	Alternative 2		Alternative 3	
	Acres	Percent[1]	Acres	Percent[1]
Acres Treated	2,474	36	1,716	25
Habitat Reduced[2]	459	7	283	4
Reduction in habitat quality[3]	1,731	26	1,088	16
Unaffected Habitat	4,313	64	5,071	75

1-Percent of available habitat
2-includes regeneration harvest and acreage of openings created by mixed-severity fire
3-includes underburning, intermediate harvest, and lands affected by low severity burning.

Alternative 2

Under alternative 2, suitable marten habitat would be reduced by 7 percent due to proposed regeneration harvest and openings created by mixed-severity burning. Habitat quality would be reduced on approximately 26 percent of the available marten habitat from proposed low-severity burning and intermediate treatments.

Habitat connectivity at lower elevations in the Lincoln Gulch and Beaver creek drainage, although 96 percent of the harvest would occur in ponderosa pine/dry Douglas-fir forests that provide less preferred marten habitat (Buskirk and Ruggiero 1994). While mixed severity burning will increase fragmentation of preferred mid to upper elevations, openings created would be widely scattered, unburned lands would be retained in all units and marten habitat connectivity on these lands would be maintained.

Alternative 3

Approximately 80 percent of the existing habitat would be unaffected and effects would be similar to those of alternative 1. Under alternative 3, suitable marten habitat would be reduced by 4 percent due to proposed regeneration harvest and openings created by mixed-severity burning. Habitat quality would be reduced on another 16 percent of the available marten habitat from proposed low-severity burning and intermediate treatments. Like alternative 2, most harvest would occur in less preferred ponderosa pine/dry Douglas fire (Buskirk and Ruggiero 1994), and habitat connectivity at mid- to upper elevations would be maintained.

Alternatives 2 and 3

Cumulative Effects

Past, ongoing and future activities are discussed under alternative 1 and a total 500 acres of suitable marten habitat would be affected, including a reduction in suitable habitat on approximately 350 acres. In addition to this, alternative 2 would affect up to another 2,474 acres. Of this there would be a reduction in habitat quality on 1,731 acres and a long-term reduction in habitat on 459 acres.

Cumulatively during the analysis period, a total of almost 3,000 acres or 16 percent of the available habitat would be affected. Of this, habitat quality would be reduced for approximately 10 years on up to approximately 1,800 acres and there would be a long-term reduction in habitat on 809 acres. Approximately 84 of the existing habitat would be unaffected, connectivity of preferred mid to upper elevation habitat would be maintained and habitat will continue to be available to support local use by marten.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated. Irretrievable commitments include a reduction in the amount and quality of suitable habitat. Habitat conditions would be restored on all sites treated in the long term.

Alternative 2 and 3 Determination

The action alternatives would reduce existing marten habitat. Suitable habitat would continue to be available and based on the above analysis and the following rationale, implementation of alternatives 2 and 3 are **not likely to cause a local or regional change in habitat quality or population status** for the American marten.

- The project area does not provide landscape conditions preferred by marten and the likelihood of direct effects are low.
- Treatments are concentrated in low elevation open canopy habitat, preferred mid to upper elevation habitat would be maintained and snag.
- Snags and DWD would continue to be available across the landscape.
- Treatments would reduce the risk of wildfire.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Marten habitat would be relatively unchanged under alternative 1. While the action alternatives would reduce suitable marten habitat, the likelyhood of mortality is low. Roads built then obliterated immediately following timber removal would be used for administrative purposes and remain closed to general use. Habitat would continue to be available within all affected watersheds. All alternatives are consistent with Plan direction (USDA Forest Service 1986) to provide habitat for small game, furbearers and other wildlife species (p. II/4), to ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17), to develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs (p. II/2) and to manage 5 percent of each 3rd order drainage for old growth (p. II/20). All alternatives are consistent with Forest Plan (p. II/20 to II-21) snag and dead wood management guidelines and with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Commonly Hunted Species

Elk

Elk are evaluated using the following criteria:

- Summer Range Hiding Cover and compliance with Plan standard 3. This requires maintaining 50 percent or more of each elk herd unit as hiding cover.
- Winter Range Thermal Cover and compliance with Plan standard 3. This requires maintaining 25 percent or more thermal cover on winter range in each elk herd unit.
- Open Road Density and compliance with Plan standard 4a. This requires that that the ratio of hiding cover to open road density be within guidelines identified by the Forest Plan during hunting season (October 15 to December 1.
- Summer Range Habitat Effectiveness Recommendations are to maintain 50 percent habitat effectiveness where elk are a primary resource consideration and 70 percent habitat effectiveness in

areas intended to benefit elk summer habitat (Christensen et al. 1993). This is based on open road density within the summer period (May 16 to October 14).

- Elk Security –This includes providing large unroaded areas of 1,000 acres or larger in size that are more than 0.50 mile from an open road.
- Elk Forage – this involves a qualitative assessment of changes in elk forage on summer, transition and winter ranges.
- Calving Areas/Transition Range
- Management Area Statndards for MAT-2, T-3, and W-1

Alternative Summary

Information presented in these tables is used in the alternative analysis presented below. Information presented in these tables is used in the alternative analysis presented below.

Table 121 displays values for hiding cover, thermal cover and big game security and whether the herd unit conditions comply with the Forest Plan.

Table 122 displays habitat effectiveness and elk security and whether the herd unit conditions are consistent with recommendations in the pertinent literature. Information presented in these tables is used in the alternative analysis presented below.

Table 122. Alternative Elk herd unit summary and Forest Plan compliance

Habitat/Plan Compliance	Alternative 1		Alternative 2		Alternative 3	
	Beaver Creek	Keep Cool Creek	Beaver Creek	Keep Cool Creek	Beaver Creek	Keep Cool Creek
Elk Hiding Cover						
Elk Hiding Cover acres (%)	18,183 (56)	15,607 (35)	15,513 (48)	15,365 (35)	16,687 (51)	15,336 (35)
Meets Plan Standard 3	Yes	No	No	No	Yes	No
Elk Winter Range Thermal Cover						
Winter Range Thermal Cover acres (%)	938 (5.3)	527 (3.8)	583 (3.3)	527 (3.8)	664 (3.7)	527 (3.8)
Meet Plan Standard 3	No	No	No	No	No	No
Open Road Density						
Open Road Density mi/mi[2]	1.4	1.3	1.4[1] (1.7)[2]	1.3[1] (1.3)[2]	1.4[1] (1.6)[2]	1.3[1] (1.3)[2]
Percent Hiding Cover	56	35	48	35	51	35
Meets Plan Standard 4a	No	No	No	No	No	No

[1]-Post-implementation road density
[2]-Density during implementation

Table 123. Alternative elk herd unit summary of habitat effectiveness and elk security

Condition/Compliance with Recommendation	Alternative 1		Alternative 2		Alternative 3	
	Beaver Creek	Keep Cool Creek	Beaver Creek	Keep Cool Creek	Beaver Creek	Keep Cool Creek
Habitat Effectiveness						
Road Miles	159.9	189.6	159.9[1] (174.2)[2]	189.6[1] (189.6)[2]	159.9[1] (174.2)[2]	189.6[1] (189.6)[2]
Square Miles	50.6	69.3	50.6	69.3	50.6	69.3
Open Road Density in mi/mi^2	3.2	2.7	3.2[1] (3.4)[2]	2.7[1] (2.7)[2]	3.2[1] (3.4)[2]	2.7[1] (2.7)[2]
Habitat Effectiveness	37	41	37[1] (35)[2]	41[1] (41)[2]	37[1] (35)[2]	41[1] (41)[2]
Meets 50 percent Recommendation	No	No	No[1] (No)[2]	No[1] (No)[2]	No[1] (No)[2]	No[1] (No)[2]
Hunting Season Elk Security						
Security Habitat Post Implementation acres (%)	8,144 (41)	10,929 (36)	8,144 (41)	10,929 (36)	8,144 (41)	10,929 (36)
Security Habitat During Implementation (%)	NA	NA	7,065 (35)	10,920 (36)	7,268 (36)	10,920 (36)

[1]-Post implementation

[2]-During implementation

Alternative 1

Direct and Indirect Effects

Summer Range Hiding Cover

Because there are no treatments proposed, there would be no immediate change in hiding cover. As shown in table 67, hiding cover would continue to occur on 56 percent of the Beaver Creek HU, which is in compliance with Plan Standard 3, and 35 percent of the Keep Cool Creek HU, which falls below the Plan threshold.

Because summer range occurs on the entire herd unit, a variety of conditions exist and the availability of future summer range hiding cover under this alternative would vary spatially and temporally. On more mesic sites that don't contain a lodgepole component, there would be little change in cover in the short term. Over the long term hiding cover would increase as stands become denser and transition from even-aged to uneven-aged conditions. Cover would also develop over time on lands affected by the 2003 Snow Talon fire, increasing cover on summer range in the Keep Cool Creek HU. The availability of cover on lands affected by MPB mortality would vary. Where mortality is scattered, cover would be largely retained in the short and long-term. In areas with concentrated mortality, hiding cover would decline in the next five to ten years as dead trees created by pine beetle mortality fall to the ground, reducing both screening and accessibility for elk. Overall, summer range hiding cover would be relatively unchanged, except in lower elevation summer range with concentrated MPB mortality, where cover would decline.

Summer Range Habitat Effectiveness

Habitat effectiveness is a function of suitable habitat components (cover, forage, wet sites, and travel routes) and reduced human disturbance (generally measured in terms of open roads and motorized trails) (Christensen et al. 1993). Because there would be no change in road access, habitat effectiveness would be unchanged. Anticipated changes in summer range cover are discussed above. Summer range forage availability, which is discussed in more detail below, would be relatively unchanged on upper elevation summer range. Forage on lower elevation summer range would continue to be low or decline due to continued conifer encroachment into grass and shrub communities and reduced access into lands with concentrated MPB mortality.

Winter Range Thermal Cover

Currently both herd units fall well below Forest Plan standard 3 related to winter range thermal cover (table 121). While thermal cover on more mesic sites that don't contain a lodgepole component would be relatively unchanged, because most of the winter range on both units is characterized by open canopy forest and non-forest, both units would continue to fall below Plan standards. Where MPB mortality is concentrated, thermal cover would be further reduced in the next five to ten years as trees fall to the ground, reducing snow intercept, as well as elk access.

Research indicates that cover conditions preferred and utilized by wintering elk vary and often include more open canopy stands (Cook et al 1998, MFWP 2011b). On more mesic sites with higher levels of snow, elk utilize denser stands throughout the winter (Thompson et al 2005, MFWP 2011b), although the canopy closure in stands utilized were lower (48 percent) than those identified in the Forest Plan (70 percent) (Thompson et al. 2005). On winter range that receive less snow fall and which are characterized by dryer sites similar to those found in the project area, open canopy forest with understory shrubs and bunchgrasses were preferred for much of the winter (MFWP 2011b). Research indicates that overall conditions on elk winter ranges should contain a diversity of conditions including more open forested stands with understory shrubs, bunchgrass communities, and patches of closed canopy forest containing arboreal forage.

While neither herd unit meets the Forest Plan standard definition of thermal cover, project area winter ranges do contain a mix of open and closed canopy forest utilized by elk, including a predominance of denser stands with greater than 40 percent canopy closure, as well as more open canopy (25 to 39 percent canopy closure) forest. Currently, winter habitat is provided in the Beaver Creek HU by 16 percent open canopy and 43 percent closed canopy forest. In the Keep Cool Creek HU winter habitat is provided by 18 percent open-canopy forest and 49 percent closed-canopy forest (table 124). Figure 90 displays existing winter range conditions, including Forest Plan thermal cover, as well as forest canopy cover conditions that are similar to those with documented elk use (Thompson et al. 2005, MFWP 2011b).

Open Road Density (Hunting Season)

While hiding cover on National Forest would be relatively unchanged in the short term, because of the large non-forest and open canopy forest component on private lands, total herd unit hiding cover would remain low and neither herd unit would comply with Forest Plan standard 4a (see table 121). Open road density and hunter access would be unchanged.

Hunting Season Elk Security

Security habitat for elk is important during the hunting season relative to elk vulnerability, population structure, and hunter success and alternative elk security is displayed in table 122. Under alternative 1, elk security would remain at its present level with security areas comprising approximately 41 percent of the Beaver Creek HU and 36 percent of the Keep Cool Creek HU. Elk security and walk in hunting opportunities will be maintained at current levels, which is consistent with objectives for this EMU (MFWP 2005).

Forage

Forage availability for elk is variable across the project area. Due to the lack of disturbance, remote wilderness and roadless lands don't contain vegetative conditions that are conducive to producing abundant forage (MFWP 2005). In the absence of future disturbances and as conifer encroachment continues, forage availability on these lands will remain low or decline. The 2003 Snow Talon fire increased forage on summer range in the Keep Cool Creek HU. Due to the large reduction in cover, elk accessibility and use has been reduced on these lands, although as cover develops, elk use of forage will increase.

Forage availability on lower elevation dry forest communities (ponderosa pine and Douglas-fir), that characterize herd unit winter and transition range will be variable, and is largely dependent on the level of disturbance. For example Makela (1991) and Hillis and Applegate (1998) (in MFWP 2011b) found that high shrub forage productivity is strongly tied to frequent fires. They concluded that shrub communities that had high fire return intervals and had not burned for many decades only produced 5 percent to 20 percent as much forage as stands that had been recently burned, although this varied by habitat type. Because the predominance of winter range forest types had relatively frequent fires historically and have missed several fire return intervals (Buhl 2015), forage availability on many of these lands has been reduced. An exception to this would be on lands affected by recent MPB mortality, where opening up of the canopy would promote understory development and increase available forage. While forage would continue to be available for the next few years, as trees fall to the ground, the reduction in cover combined with the increase in jackstrawed down wood will reduce access and forage availability for elk. So overall, in the absence of future disturbance, forage availability on summer range would be relatively unchanged, whereas forage availability on winter ranges would remain low or decline.

Calving Areas

While there may be localized changes in cover and forage associated with ongoing MPB mortality, because there are no treatments proposed, there are no direct or indirect effects to elk calving areas under this alternative.

Management Areas

There will be no changes to the existing conditions, as described in Section 3.5.1, for the Plan standards in MAs T-2, T-3, and W-1.

Cumulative Effects

The combined boundaries of the Beaver Creek and Keep Cool Creek herd units make up the cumulative effects boundary. This area was selected because it includes all areas affected by treatment as well as lands affected by recent wildfires and MPB mortality. As a result both stand and landscape level habitat can be assessed. Past, ongoing and future activities are in volume 2, appendix C. Activities that affect elk include grazing, wildfire, timber harvest, firewood collection and hazard tree removal, as well as recreational activities associated with mining, hunting and other dispersed use. Because there is no change in public access, dispersed recreational use is expected to remain relatively unchanged. Potential ongoing and future long-term effects that could occur during the analysis period and affect elk habitat include grazing, hazard tree removal, firewood collection, invasive plants treatment, recent wildfire, prescribed burning and timber harvest, which are summarized by herd unit in table 123 and discussed below.

Table 124. Alternative 1, summary of ongoing and future effects that may impact elk habitat

Activity	Beaver Creek			Keep Cool		
	Total Acres Affected	Hiding Cover Affected (acres)	Thermal Cover[1] Affected (acres)	Total Acres Affected	Hiding Cover Affected (acres)	Thermal Cover[1] Affected (acres)
Grazing	5,945	2,730	294	8,694	5,663	103
Hazard Tree Removal	251	184	8[2]	169	112[2]	0
NNIS Treatment	2,564	872	4	475	186	3
Timber Harvest	126	96[2]	18[2]	60	43[2]	0
Prescribed Fire	0	0	0	17	13	0
Recent Wildfire	3	3[3]	0	145	21[3]	0

1 – Forest Plan winter range thermal cover

2 – Results in a reduction in Forest Plan hiding and thermal cover on the acres affected

3 – Reduction in Forest Plan hiding cover on 60 percent of the acres affected.

Summer Range Hiding Cover

Alternative 1 would not directly affect summer range hiding cover. Indirectly, hiding cover will increase over time in most areas, although lower elevation areas with high MPB mortality hiding cover is expected to decrease in the short term. Although grazing and invasive species treatment occur within acres identified as hiding cover, these activities will not remove hiding cover. Prescribed fire effects would be similar to those described under treatment effects for low severity fire, and the overstory would remain largely intact. Hazard tree removal, timber harvest off-Forest, and wildfire would result in reductions in hiding cover in addition to those in low elevation areas with MPB mortality. These actions therefore result in 282 less acres of hiding cover in the Beaver Creek HU and 168 less acres in the Keep Cool Creek HU. The no-action alternative, taken cumulatively with other activities, results in 55 percent hiding cover in the Beaver Creek HU and 35 percent hiding cover in the Keep Cool Creek HU. While the Hazard Tree Removal reduced habitat along road corridors, the analysis for the hazard tree removal project concluded that even though both herd units were below Forest Plan standards for hiding and thermal cover, and a site-specific amendment was developed, that elk numbers should not be altered. This was disclosed in a site-specific Forest Plan amendment for that project.

Summer Range Habitat Effectiveness

As alternative 1 will have no direct or indirect effects on habitat effectiveness, there will be no cumulative effects.

Winter Range Thermal Cover

Alternative 1 would not directly alter thermal cover, however, over time thermal cover will decrease where MPB mortality is concentrated as dead trees fall in the next 5 to 10 years. Thermal cover will not be altered by grazing, invasive species treatment, or prescribed fire. Twenty-six acres of thermal cover in Beaver Creek HU has been removed by hazard tree removal and timber harvest off National Forest System lands, resulting in a cumulative effect of 5.1 percent thermal cover in the Beaver Creek HU. There are no changes to thermal cover in the Keep Cool Creek HU.

Open Road Density (Hunting Season)

Alternative 1 will have no changes to the miles of open roads, therefore there are no cumulative effects.

Hunting Season Elk Security

Alternative 1 will have no changes to acres of elk security, therefore there are no cumulative effects.

Forage

Alternative 1 results in a relatively unchanged forage availability on summer range and a low or decline forage availability on winter range. Activities that reduce cover (hazard tree removal, timber harvest, wildfire) would result in increases in forage availability, while reduction of invasive species and prescribed fire can increase the quantity and quality of available forage. Properly managed cattle grazing can increase the productivity, diversity and nutritive quality of forage, however elk tend to use areas that don’t contain cattle (Rapp 2006). Under existing allotment management plans continued use is expected to be moderate to light, whereas cattle/elk interactions are not expected to increase and habitat that is largely unaffected by livestock would continue to be available. In all, forage quality and quantity would be expected to increase on 2,944 acres (9 percent) of the Beaver Creek HU and 866 acres (2 percent) of the Keep Cool Creek HU.

Summary

Cumulatively, approximately 450 acres of hiding cover and 26 acres of thermal cover would be removed under alternative 1. There would be localized reductions in cover due to MPB mortality; although, landscape-level forage and cover conditions would remain largely unchanged. Ongoing and future uses are not expected to change, many activities would result in short-term effects, and human access and elk security would be maintained.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments of resources anticipated under the no-action alternative

Alternative 1 Determination and Conclusions

Under alternative 1, Forest Plan summer range hiding cover would be unchanged and in the Beaver Creek HU would meet Plan standard 3, while the Keep Cool Creek HU would continue to fall below Forest Plan direction. Thermal cover would be reduced on elk winter range in both units due to MPB mortality and would not meet Plan standard 3. The open road density (hunting season) standard (plan standard 4) would not be met in either HU due to the lack of hiding cover present. Neither HU would meet the 50 percent habitat effectiveness rating recommended by Christensen et al. (1993) due to private road miles in the respective HU, and each HU would retain 36 percent security (Keep Cool)) and 41 percent security (Beaver Creek). Forage availability would decrease due to continued conifer encroachment, but would increase with loss of cover. Thermal cover on winter range in management area T-2, hiding cover in management area T-3, and thermal cover on management area W-1 would all remain below plan standards. Despite this, habitat would continue to be available to support desired levels of elk, as identified in the Elk Plan (MFWP 2005) and evidenced by elk numbers being at or near objectives for the past five years (J. Kolbe, pers. comm. January 27, 2015). Due to increased fuel loading, the risk of stand-replacing wildfire is greatest under this alternative.

Alternatives 2 and 3

Alternative changes in hiding cover, thermal cover, security and habitat effectiveness are displayed in table 121 and table 122.

Direct Effects and Indirect Effects

Elk are highly mobile, therefore, direct mortality from burning or harvest is unlikely. Elk would avoid treatment sites during treatment and following treatment, which will alter movement and use of the project area by elk (Wisdom et al 2005). Harvest would be implemented over five years and displacement would be reduced with implementation of pdfs that restrict the number of watersheds that that can operated at a time (project design feature WL-14 ELK). Similarly, because burning would occur over 10 years, is spread out over multiple watersheds and would leave unburned lands in all units, suitable habitat would continue to be available for animals temporarily displaced during treatment..

Intermediate Harvest

Harvest in combination with burning would remove live trees, dead and dying trees and smaller diameter downed wood, which would reduce elk cover on the site. Because canopy closure would be reduced to 25 to 40 percent under alternative 2, these stands would no longer meet the plan definition of hiding cover. An exception to this would be lands within the INFISH buffer, where live trees and increased levels of standing and down wood would be retained. Under alternative 3 canopy closure would be reduced to 25 to 40 percent on precommercial thinning units and approximately a third of the improvement cutting, whereas 40 percent or more canopy and Plan hiding cover would be retained on most of the proposed improvement cutting. As described in the Methodology section, this analysis utilizes the MFWP definition of hiding cover identified in the Forest Plan (USDA 1986 p. II.18); that is, a stand of coniferous trees having a crown closure of greater than 40 percent with a minimum patch size of 40 acres. Hiding cover surveys in the project area have validated this relationship between canopy cover and functional hiding cover [see the Stonewall Elk Hiding Cover Synthesis/Management Area T2 and T3 Focus report in the project record]. As such, it's reasonable to conclude that a post-treatment stand of 40 percent canopy cover would continue to provide functional hiding cover. Openings created in the canopy would promote development of herbaceous and woody vegetation within a few years of treatment, resulting in an increase in forage that may last for 10 years (Rapp 2006, Wisdom et al. 2005), although the amount of forage would vary by post-treatment canopy cover.

Regeneration Harvest

Because most live trees as well as snags and smaller diameter downed wood will be removed, sites would no longer provide elk cover. The reduction in canopy cover combined with site preparation would increase herbaceous and woody vegetation and elk forage for 10 to 20 years, although this will decline over time (Rapp 2006, Wisdom et al 2005, Hayden et al 2008). The availability of forage for elk would depend on its proximity to cover and generally the highest elk use would occur within approximately 300 to 500 feet of cover, with use decreasing with increasing distance from edges/cover (Thompson 1988, Wisdom et al. 2005). Several studies have been conducted that describe an optimum cover/forage ratio. Black et al. (1976, p. 12) define optimum habitat as 40 percent cover, 60 percent forage. They even suggest that a reduction in cover may be appropriate to increase elk use in an area (until, of course, cover becomes limiting) particularly if forage is limiting (Ibid p. 20). As described in the Affected Environment section, forage is limiting in the project area except in the Snow Talon Fire perimeter (figure 76). Note the predominance of forested stands in the project area. The forage created as a result of that fire is of limited value due to the absence of cover. Forage that would be created through the Stonewall Project would be of the configuration (i.e. cover and forage intermixed) to be beneficial to elk.

Low-Severity Burning and Underburning

Low- severity burning would reduce down woody debris, some tree seedlings/saplings and understory cover. There would be some overstory mortality, although this would be scattered and stands would continue to meet the Forest Plan definition of hiding and thermal cover. Approximately 20 percent of all sites would remain unburned and unaffected hiding and thermal cover would be interspersed with treated areas.

Prescribed fire is routinely used to create or enhance elk habitat and has been shown to encourage early spring green-up, improve transition range, reduce conifer encroachment, increase palatability, and stimulate regeneration of aspen (Leege 1979 in USDA Forest Service 2011b, Sachro et al. 2005, Hillis and Applegate 1998, Van Dyke and Darragh 2007, Long et al. 2008a, Long et al. 2008b, Canon et al. 1987). Forage would increase within a few years of treatment and would remain high for 10 to 12 years (USDA FS 2011b). Year-round forage species that would be expected to increase include shrubs such as ceanothus (Crotteau et al. 2012), Rocky Mountain maple, and serviceberry (Lentile et al. 2007).

Burning in shrub and grasslands has also been shown to increases both production and nutritional quality that benefit elk (Van Dyke and Darragh 2007) and low severity fire generally has the greatest benefit to elk when a mosaic of burned and unburned lands is available (USDA Forest Service 2011b, Long et al. 2008a).

Mixed Severity Burning

Sites proposed for mixed-severity burning that experience a low-severity burn would be similar to that described previously. Those portions of the site that experience moderate to severe burning would have a long-term reduction in overstory cover, although the response of the understory would vary over time. Grasses and forbs would become established within one to two years of treatment whereas shrubs and tree seedlings would become established within five years (Hirsh 2012, Collins and Stephens 2012, Crotteau et al. 2012). While there would be a stand level reduction in cover in fire created openings, the interspersion of burned and unburned land would enhance landscape level habitat by providing a mosaic of forage and cover (USDA Forest Service 2011b). For summer ranges, Thomas (1979) suggests openings from 10 to 40 acres are used by elk, whereas use is greatly reduced on larger openings. While it is difficult to determine the size and spatial arrangement of openings, because cover would be retained on 70 percent or more of the site, it is expected that many of the openings created by mixed-severity burning would be within 300 to 500 feet of hiding cover and provide forage for elk within a few years of treatment (Thompson 1979, Thompson 1988, Wisdom et al. 2005).

Summer Range Hiding Cover

Approximately 78 percent of the summer range hiding cover under alternative 2 and 84 percent under alternative 3 would be unaffected by treatment and hiding cover on these lands would be similar to those described under alternative 1.

Hiding cover will be reduced on lands affected by treatment and table 121 summarizes the changes to elk hiding cover on summer range under the action alternatives. Under alternative 2, harvest and mixed severity burning would reduce hiding cover in the Beaver Creek HU from 56 percent to 48 percent, and reduce cover to 51 percent under alternative 3. Within the Keep Cool Creek HU, mixed severity fire would reduce hiding cover from 36 percent to 35 percent under both action alternatives. Neither herd unit would meet Forest Plan standard 3 for summer range hiding cover under alternative 2, while the Keep Cool Creek HU would not meet Forest Plan standard 3 for summer range hiding cover under alternative 3. Elk use of the landscape would change as elk seek out places where hiding cover remains post-treatment.

Summer Range Habitat Effectiveness

Alternative changes in habitat effectiveness are displayed in table 122. With construction of roads built and then obliterated after use, and use of closed roads for haul and administrative use between May 16th and October 14th, open road densities would increase during implementation and habitat effectiveness would be reduced within the Beaver Creek herd unit under both alternatives. Open road density during this period would increase to 3.4 miles per square mile under both alternatives (less than 50 percent habitat effectiveness). There are no changes to the open road densities in the Keep Cool Creek HU during implementation (2.7 miles per square mile).

Project operations during implementation are likely to redistribute elk on summer range. Project design features would serve to minimize some of the impacts. For example, logging activities would be confined to a single drainage at a time (pdf WL-14 ELK), which would increase the probability of immediate return by displaced elk. Also, roads built and then obliterated after use would be closed to the public which should reduce some of the displacement of elk.

Because all roads constructed would be obliterated following use and roads used for haul would return to their pre-project conditions, habitat effectiveness would be restored to the existing condition following implementation. Both herd units would remain below the 50 percent habitat effectiveness recommendation post-implementation..

Winter Range Thermal Cover

Alternative changes in Forest Plan thermal cover resulting from treatment are displayed in table 121. There are no changes in amount of thermal cover in the Keep Cool Creek HU in any alternative. In the Beaver Creek HU, alternative 2 results in a loss of 355 acres of existing thermal cover, while alternative 3 removes 274 acres of thermal cover. As the total available thermal cover is already low, these reductions amount to a loss of 38 percent of the available thermal cover under alternative 2 and 29 percent under alternative 3. As in alternative 1, neither herd unit would meet standard 3 under the action alternatives.

Project area winter range conditions under alternatives 1 through 3, including Plan thermal cover, as well as open- and closed-canopy forest (see alternative 1 discussion) are displayed in figure 90 (alternative 1), Figure 91 (alternative 2), and Figure 92 (alternative 3) and summarized in table 124. Conditions under alternative 1 serve as a baseline from which to compare the action alternatives. In the Keep Cool Creek HU there is very little change (1 percent) in the amounts of open and closed canopy forest, and conditions will continue to provide winter range for elk. More acres will move from closed canopy forest to open canopy forest in the Beaver Creek HU under the action alternatives and larger blocks of open canopy forest would be created, however winter habitat will continue to be available. Patch size and connectivity of closed-canopy forest would be reduced, particularly in the Beaver Creek and Lincoln Gulch drainages.

Table 125. Alternative winter range cover on project area elk herd units

Cover/Habitat	Beaver Creek			Keep Cool Creek		
	Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3
	%	%	%	%	%	%
Plan Thermal Cover	5.3	3.3	3.7	3.8	3.8	3.8
Open Canopy Forest	16	23	20	18	19	19
Closed Canopy Forest	43	33	37	49	48	48

Open Road Densities (Hunting Season)

Within the Beaver Creek HU, alternative 2 proposes to construct 2.6 miles of road for project use that will be obliterated after implementation. Alternative 3 proposes 0.4 miles of road construction. These roads would be closed to public use. Closed roads that would be used for administrative use (i.e. haul) would occur on 14.3 miles under alternative 2 and 11 miles under alternative 3. Changes in road density during implementation are displayed in table 121. While open road density would increase, because these roads are not available to the public and activity would be confined to a single drainage at a time, impacts to elk would be reduced. Post implementation within the Beaver Creek herd unit, road densities would return to their pre-project level (see table 121). Within the Keep Cool HU, there would be a no increase in open road density during implementation (see table 121). As shown in table 121, Plan standard 4a would not be met in the existing condition, during project implementation, or post-implementation.

Allowable open road densities are dependent on the amount of hiding cover in the herd unit. A reduction in cover has been shown to increase the vulnerability of elk to harvest and there would be a possibility of a short-term increase in hunting mortality, although this would be reduced by restricting public access during and post implementation (Wisdom et al. 2005, Rapp 2006).

Hunting Season Elk Security

Effects to elk security are displayed in table 122. Both alternatives would utilize currently closed roads during harvest and construct roads to be obliterated after use, therefore elk security would be reduced during implementation. Under alternative 2 security is reduced in Beaver Creek HU by 1,079 acres, while Keep Cool Creek HU is reduced by 9 acres. Under alternative 3 reductions amount to 876 acres in the Beaver Creek HU and 9 acres in the Keep Cool Creek HU. Post treatment, project roads built would be obliterated, all existing roads would be returned to their pre-project status and elk security would be restored to 41 percent of the Beaver Creek HU and 36 percent of the Keep Cool Creek HU.

Elk would be displaced from areas of management activity to more secure areas during implementation. Because harvest and road use would be restricted to one drainage at a time, the amount of security habitat reduced across the herd units during any one year would be reduced. Eighty-seven percent or more of the existing security habitat would be maintained, there would be no change in public access and security habitat would continue to be available within both herd units. Also, elk security and walk-in hunting opportunity objectives identified for this EMU (MFWP 2005) would be maintained.

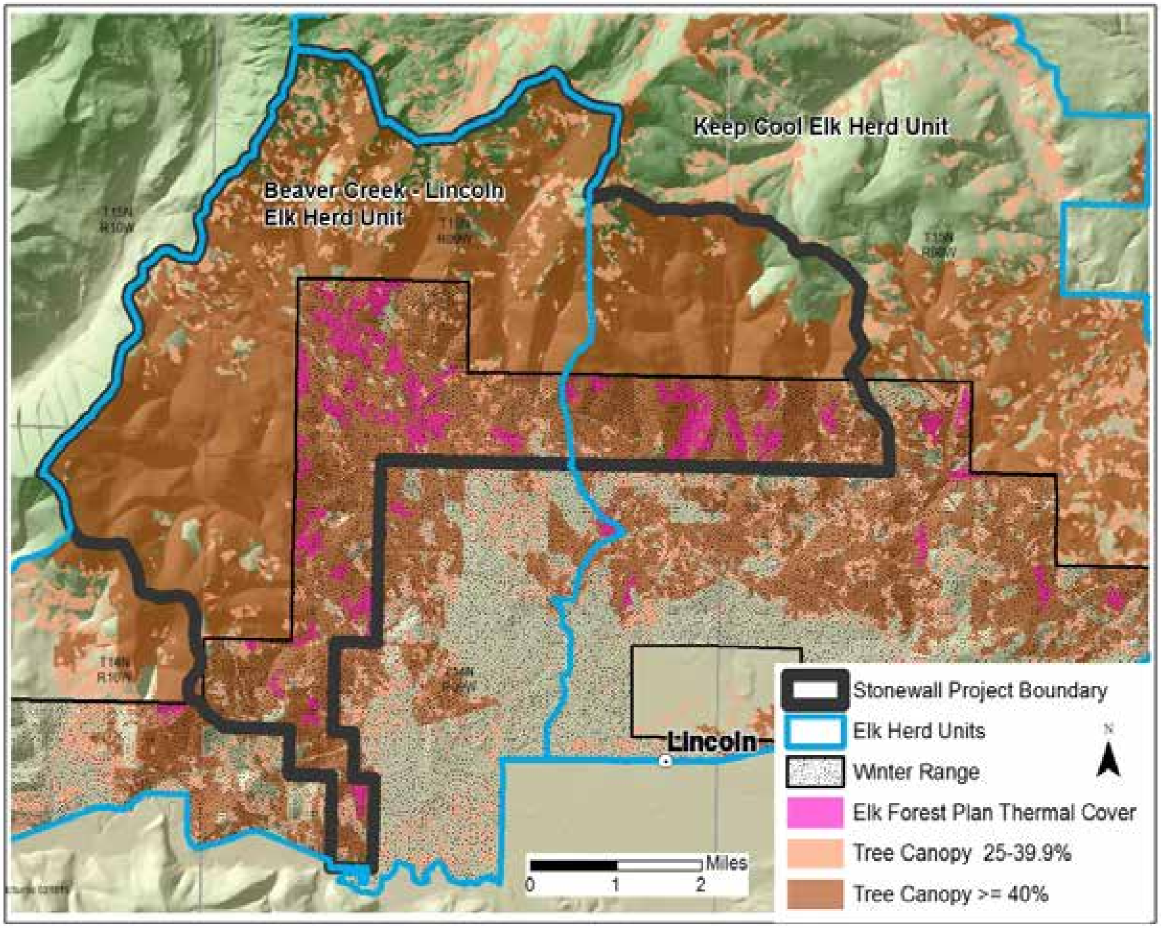


Figure 90. Alternative 1 elk winter range cover conditions

Forage

Both alternatives would reduce summer range cover and increase forage diversity and availability, which would modify elk use of the project area. Under alternative 2, 860 acres of regeneration harvest in Beaver Creek HU would increase available forage habitat and 3,073 acres of prescribed fire would increase forage quality on all burned acres and available forage habitat on approximately 30 percent of the acres with mixed severity burning. In the Keep Cool Creek HU alternative 2 proposes 108 acres of regeneration harvest and 2,390 acres of prescribed fire. Proposed treatment acres under alternative 3 are reduced, with Beaver Creek HU having 708 acres of regeneration harvest to increase forage habitat and 2,535 acres of prescribed fire to increase forage quality and availability. In Keep Cool Creek HU alternative 3 proposed the same acres of regeneration harvest and a lesser amount of prescribed burning (1,729 acres). While cover would be reduced, landscape conditions provided would be closer to those that occurred historically and suitable elk habitat would continue to be available. Because proposed treatments would promote forage within roadless areas and upper elevation summer range, they are consistent with objectives for this EMU (MFWP 2005). Alternative 2 would provide for increases in forage on more acres than alternative 3, as there is more regeneration harvest and resulting open canopy stands under this alternative.

Calving Areas/Transition Range

The potential for project activities to negatively impact elk calving is relatively low. The overlap of project activities with the elk calving period is typically limited due to wet conditions during the spring. Harvest activities would be suspended during the spring break-up period which is typically occurs from late-March/early-April to mid to late June in most years. Similarly, wet spring conditions limit suitable spring burn windows reducing the potential of prescribed burn activities occurring during the elk calving period. To minimize the potential for project activities to displace elk from suitable birthing areas the following project design feature (WL-13 Elk) was developed to apply to all management activities:

> "If elk calving (late May through mid-June) or nursery areas (late June through July) are identified prior to or during project implementation, management activities will be delayed during active periods."

In the long term it is anticipated that harvest and prescribed burning will result in an increased abundance of succulent and nutritious vegetation that will enhance habitat suitability for elk calving within the project area. This type of response has been observed in the Copper Creek drainage to the east of the project area where following the 2003 Snow Talon fire elk have made extensive use of the burn area for calving. Because both the amount and the nutritional value of forage would be increased, prescribed fire would improve spring forage habitat (Long et al. 2008a, Long et al. 2008b) on transition range and benefit elk during calving and nursing periods.

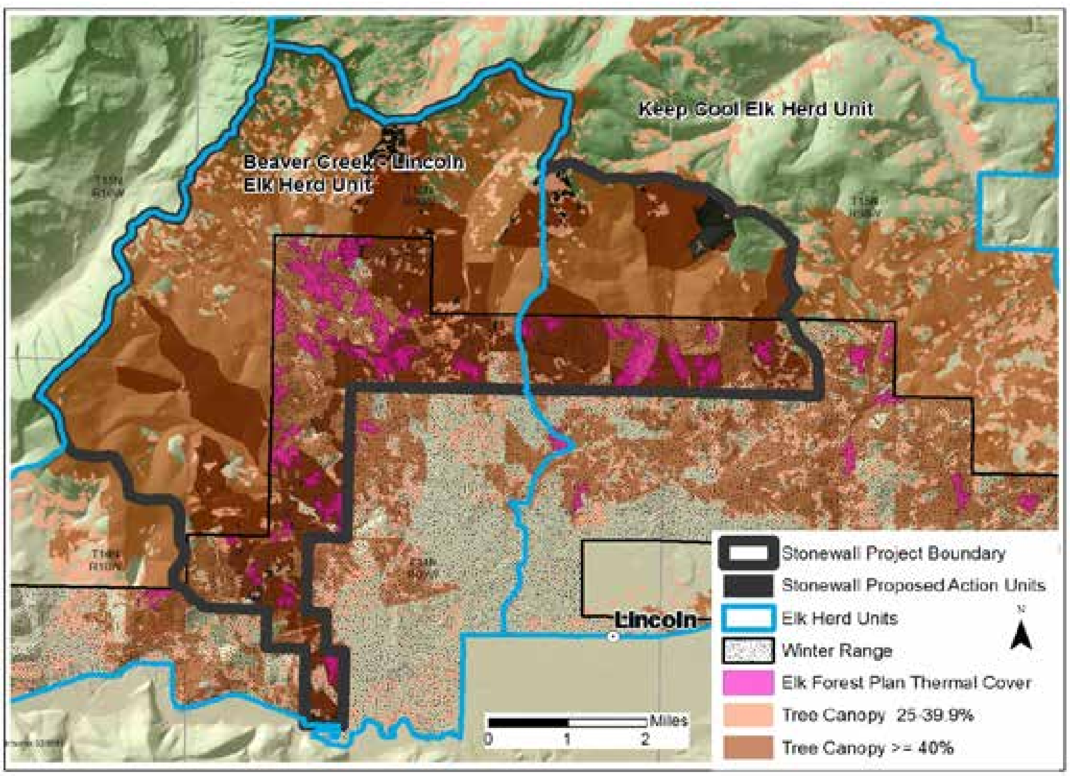


Figure 91. Alternative 2 elk winter range conditions

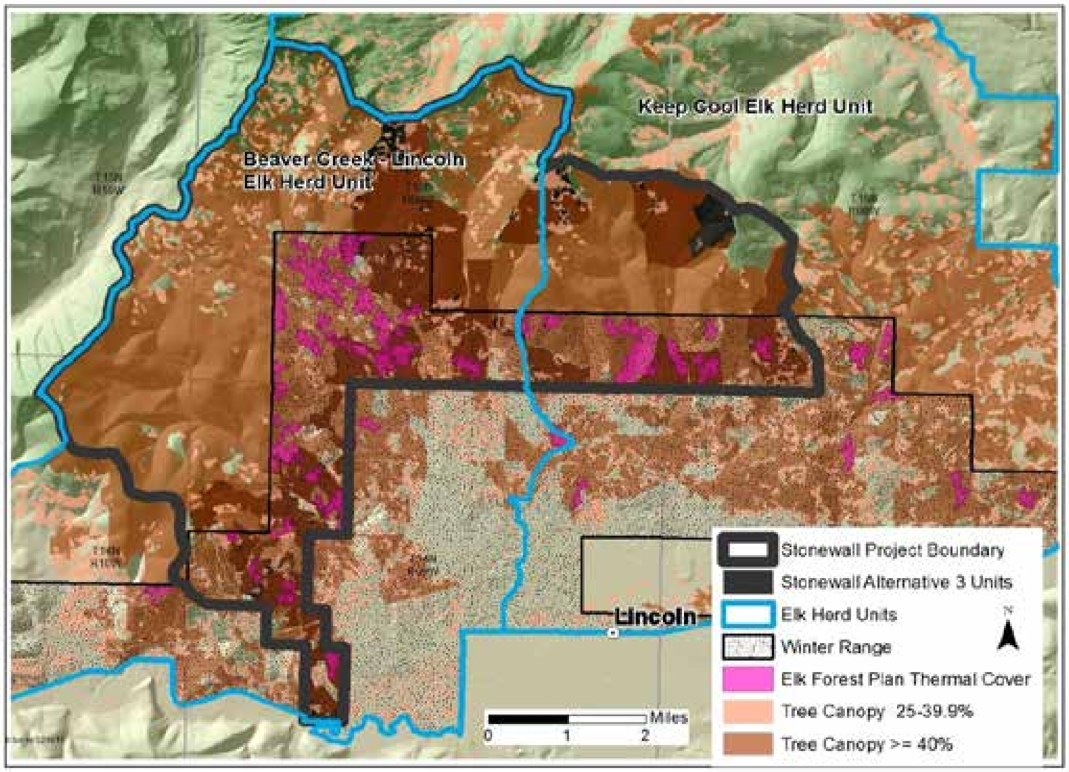


Figure 92. Alternative 3 elk winter range conditions

Management Area T-2

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat – All roads to be constructed would be closed to public use and obliterated following implementation. Prescribed fire goals include improving forage diversity and production in big game winter ranges.

Maintain adequate thermal cover and hiding cover adjacent to forage areas. Generally this means providing 25 percent thermal cover on identified winter range – Alternative 2 would reduce hiding cover by 952 acres, leaving hiding cover on 40 percent of the management area. Alternative 3 would reduce hiding cover by 416 acres, leaving hiding cover on 72 percent of the area. Table 124 displays the effects on thermal cover by alternative. Both alternatives 2 and 3 reduce thermal cover by 162.5 acres, leaving 6 percent thermal cover on 2,083 acres of winter range in this management area (6% thermal cover also remains in 1,559 acres of winter range within the project boundary). Treatment areas and alternative cover are displayed in figure 93 (alternative 2) and figure 94 (alternative 3). Because of reduced harvest, alternative 3 provides a better distribution of closed canopy habitat. Management area T-2 winter range does not currently provide 25 percent thermal cover. Both action alternatives would move further away from Management Area T-2 Forest Plan thermal cover thresholds. This situation will be addressed in a separate site-specific Forest Plan amendment

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested – Figure 93 and figure 94 display past harvest units that do not meet hiding cover requirements. For alternative 2 adjacent areas include units 46, 47, 49, and 72. For alternative 3, adjacent units include units 46a, 47a, 47c, and 72. In order to meet this requirement, a minimum of 22 acres of treatment under alternative 2 and 12 acres of treatment under alternative 3 would have to be dropped from the proposed harvest. This situation is addressed with a site-specific Forest Plan amendment.

Schedule sale activities outside the winter periods (December 1 to May 15) – Winter logging will not be allowed in elk winter range.

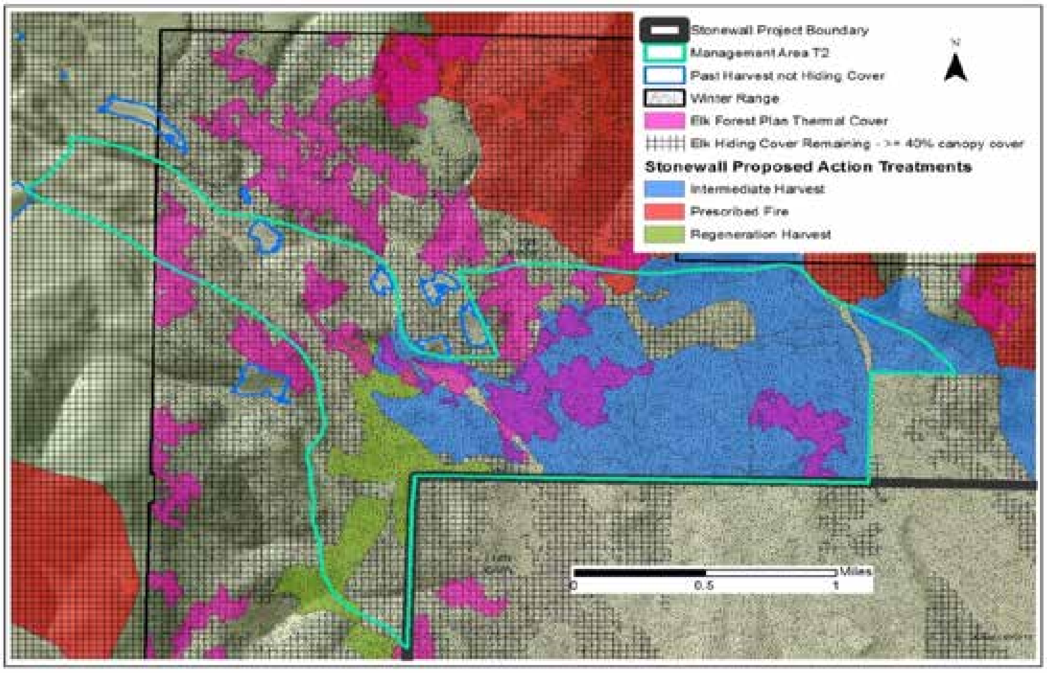


Figure 93. Alternative 2, treatments and cover in management area T-2

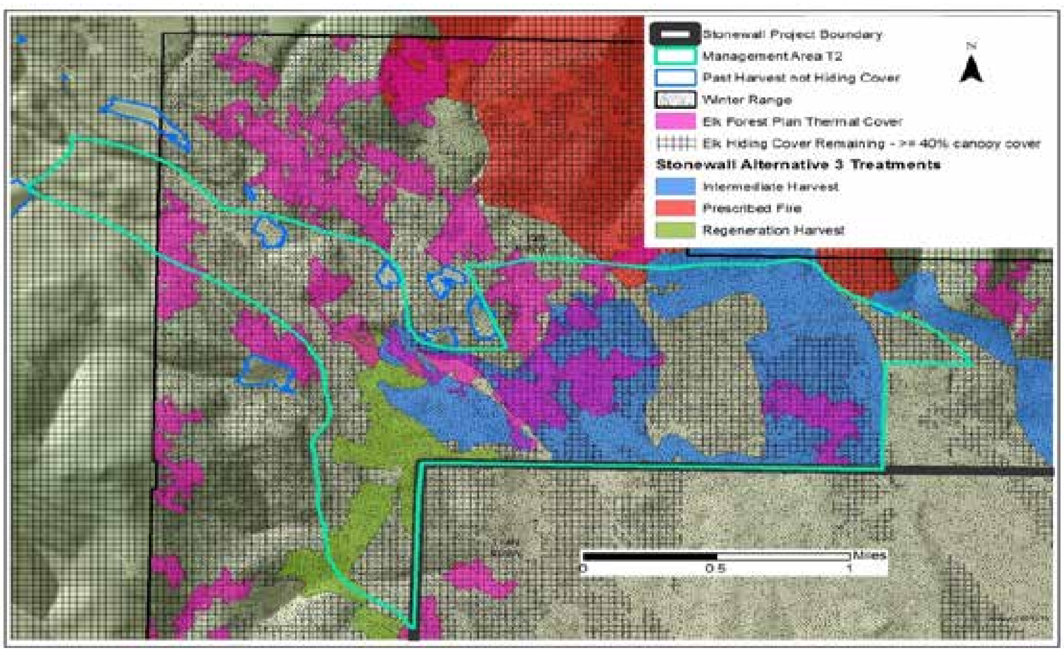


Figure 94. Alternative 3 treatments and cover in Management Area T-2

In addition to the effects on the management area plan standards, forage would be increased on up to 952 acres of Management Area T-2. Disturbance is expected during project implementation, and is reduced by limiting activities to specific portions of the project area at a time.

Management Area T-3

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain or enhance the quality of big game summer habitat – All new roads would be closed to public use and decommissioned following implementation. Prescribed burning goals include improving forage diversity and production in big game summer ranges.

Maintain 50 percent hiding cover (MFWP definition) for big game – Alternative 2 would reduce hiding cover by 872 acres, leaving hiding cover on 76 percent of the management area in the project area. Alternative 3 would reduce hiding cover by 581 acres, with 81 percent of the area remaining in hiding cover post-implementation. Table 124 displays the effects on hiding cover by alternative. Figure 95 displays the treatment units and remaining hiding cover for alternative 2 while figure 96 displays the treatment units and remaining hiding cover for alternative 3 Both action alternatives would be consistent with the Management Area T-3 hiding cover standard.

Maintain thermal cover adjacent to forage areas – Figure 95 and figure 96 display the remaining hiding cover in relation to regeneration harvest units that will provide forage and past activity areas that do not yet provide hiding cover, and therefore currently are assumed to provide forage, for each of the action alternatives. Thermal cover is adjacent to forage areas and will be slightly reduced (from 7 percent to 6 percent) by both alternatives on the Beaver Creek HU.

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested – Figure 95 and figure 96 display past harvest units that do not meet hiding cover requirements. For alternative 2 adjacent areas include units 25, 26, 33, 36, 37, 38, 54, 55, 59, 65 and 68. For alternative 3, adjacent units include units 25, 36, 37, 38, 59, and 68. In order to meet this requirement, a minimum of 95 acres of treatment under alternative 2 and 39 acres of treatment under alternative 3 would have to be dropped from the proposed harvest. This situation is addressed with a site-specific Forest Plan amendment.

Management Area W-1

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat – All roads to be constructed would be closed to public use and obliterated following implementation. Prescribed fire goals include improving forage diversity and production in big game winter ranges.

Maintain adequate thermal cover and hiding cover adjacent to forage areas. **Generally this means providing 25 percent thermal cover, where available, on identified winter range** – Table 125 displays the amount of hiding and thermal cover , by alternative, in management area W-1. Percent hiding cover is not altered under any alternative. Although thermal cover is below the Forest Plan standard of 25 percent for management area W-1, none of the action alternative will alter the existing level of thermal cover.

Table 126. Alternative effects to Management Area Plan standards

Habitat/Plan Compliance	Alternative 1	Alternative 2	Alternative 3
Management Area T-2 Winter Range Thermal Cover (Beaver Creek HU only)			
Winter Range Thermal Cover	276.4 acres (13%) of which 251 acres (16%) are within the project boundary	113.9 acres (6%) of which 89 acres (6%) are within the project boundary	113.9 acres (6%) of which 89 acres (6%) are within the project boundary
Meets Plan Standard	No	No	No
Management Area T-3 Hiding Cover			
Elk Hiding Cover acres (%)	5,159 (91)	4,287 (76)	4,578 (81)
Meets Plan Standard	Yes	Yes	Yes
Management Area W-1 Hiding Cover			
Elk Hiding Cover Acres (%)	3,452 (74)	3,452 (74)	3,444 (74)
Management Area W-1 Thermal Cover (Keep Cool Creek HU only)			
Winter Range Thermal Cover Acres (%)	43.2 (22)	43.2 (22)	43.2 (22)
Meets Plan Standard	No	No	No

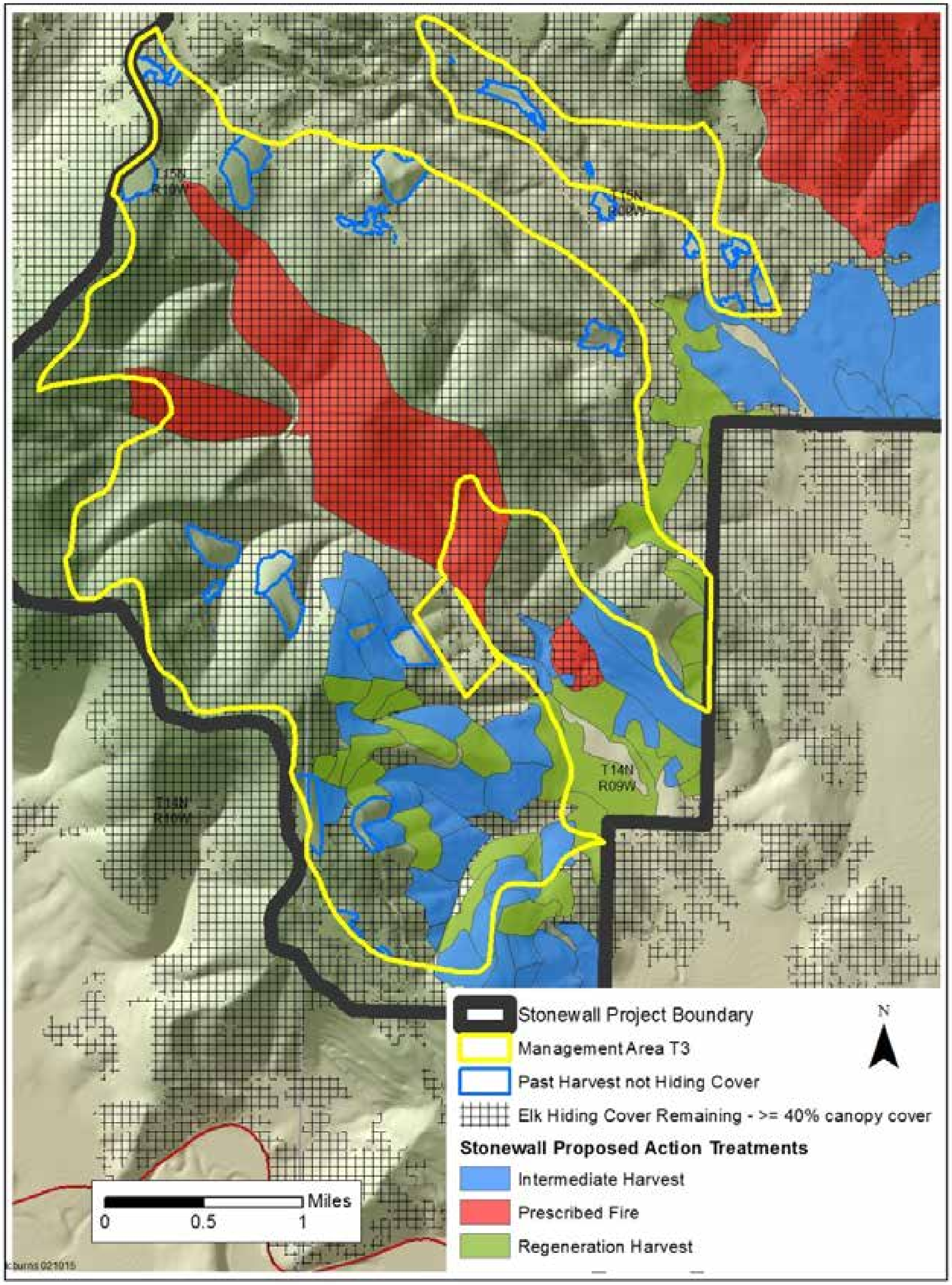


Figure 95. Alternative 2 Treatments and Cover in Management Area T-3

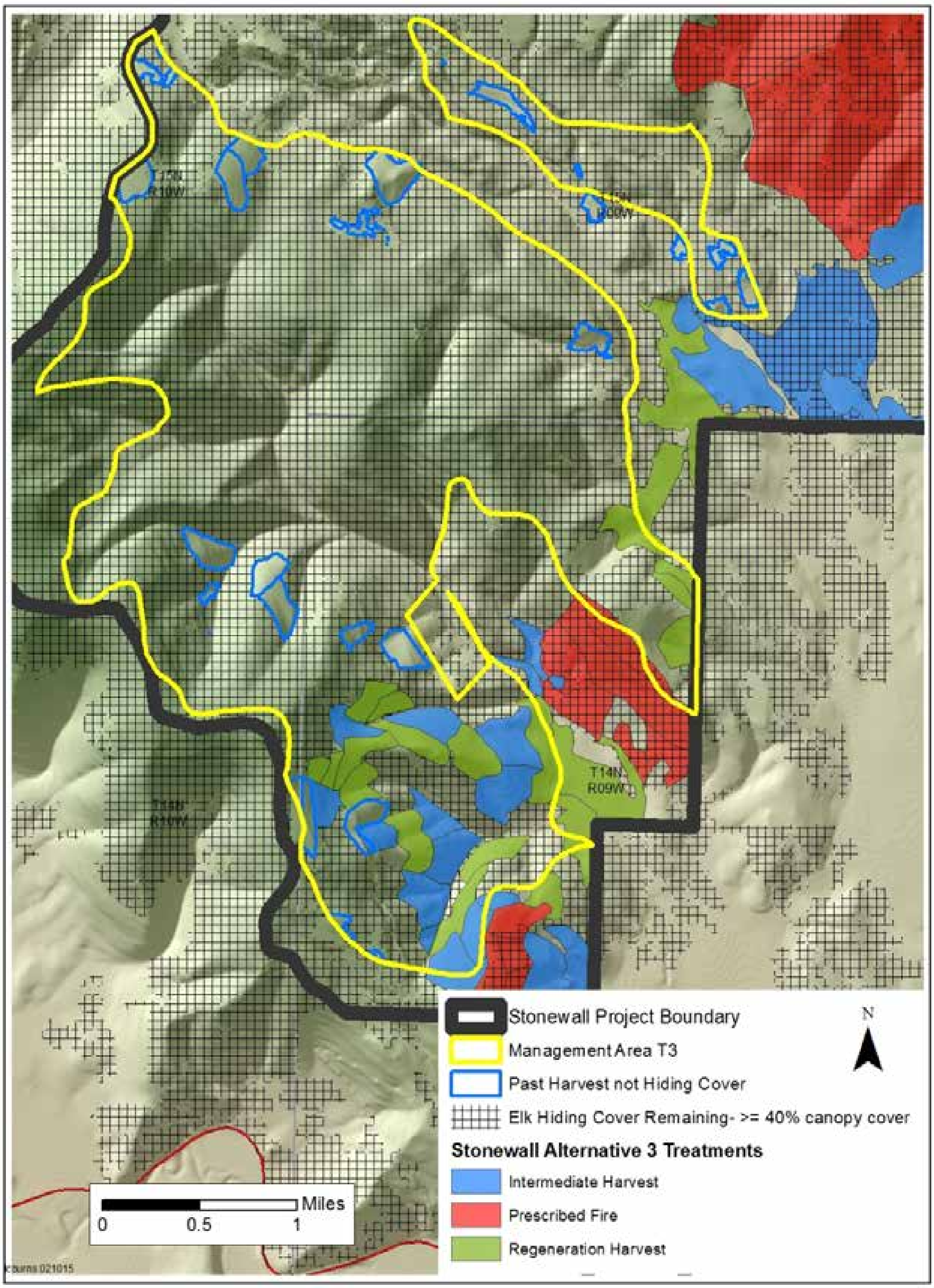


Figure 96. Alternative 3 Treatments and Cover in Management Area T-3

Cumulative Effects

As described for alternative 1, past, ongoing and future activities are summarized in volume 2, appendix C. The decision for the Blackfoot Non-winter Travel Plan (2014), which effects summer range habitat effectiveness, open road density, and hunting season elk security is not yet made; analysis will be based on the preferred alternative for that project (Blackfoot Non-winter alternative 4). See also the cumulative effects discussion in the elk amendment section.

Summer Range Hiding Cover

Reductions in hiding cover from Hazard Tree Removal, timber harvest off-forest, and wildfire would add cumulatively to the reductions under alternatives 2 and 3. Indirectly, hiding cover will increase over time in most areas, although lower elevation areas with high MPB mortality hiding cover is expected to decrease in the short term. Although grazing and invasive species treatment occur within acres identified as hiding cover, these activities will not remove hiding cover. Prescribed fire effects would be similar to those described under treatment effects for low severity fire, and the overstory would remain largely intact. While the Hazard Tree Removal reduced habitat along road corridors, the analysis for the hazard tree removal project concluded that even though both herd units were below Forest Plan Standards for hiding and thermal cover, and a site-specific amendment was developed, that elk numbers should not be altered. This was disclosed in a site-specific Forest Plan amendment for that project. Under alternative 2, an additional loss of 282 acres of hiding cover in the Beaver Creek HU results in 47 percent hiding cover while in the Keep Cool Creek HU an additional reduction of 168 acres results in 34 percent hiding cover. Under alternative 3, Beaver Creek HU would maintain 51 percent hiding cover, while Keep Cool Creek HU would maintain 34 percent hiding cover. Cumulatively, these additional reductions account for 1 percent or less of the hiding cover in the herd units. It is unlikely such a small cumulative change would impact elk population numbers in the affected herd units.

Summer Range Habitat Effectiveness

Although the Stonewall Project will not alter habitat effectiveness post-implementation, there are reductions in habitat effectiveness during project implementation. The Blackfoot Non-winter Travel Plan would make decisions regarding road and trail management, and therefore alters the miles of routes open during the summer. Upon implementation of the preferred alternative in the Blackfoot Non-winter Travel Plan, existing open road miles would be reduced to 151.8 miles in the Beaver Creek HU and 170.3 miles in the Keep Cool Creek HU. These reductions will result in density of open routes of 3.0 miles per square mile in the Beaver Creek HU and 2.5 miles per square mile in the Keep Cool Creek HU. If the travel plan decision is made prior to implementation of the Stonewall project, then density of open routes during implementation in the Beaver Creek HU would be 3.3 miles per square mile under alternative 2 and 3.2 miles per square mile under alternative 3. There would be no change to the open route density in the Keep Cool Creek HU during project implementation. Despite these lower route densities, habitat effectiveness would remain below 50 percent in both herd units under both action alternatives.

Winter Range Thermal Cover

Alternative 2 and 3 result in reductions in thermal cover in the Beaver Creek HU. Hazard Tree Removal and timber harvest off National Forest lands resulted in a reduction of 26 acres of thermal cover in the Beaver Creek HU. This results in thermal cover of 3.1 percent under alternative 2 and 3.6 percent under alternative 3. It is unlikely such a small cumulative change would impact elk population numbers in the Beaver Creek HU. There are no changes to thermal cover in the Keep Cool Creek HU.

Open Road Density (Hunting Season)

Although the open road density during the fall hunting season is unchanged from the existing condition post-implementation, the action alternatives result in a temporary increase in the density of open routes during implementation in the Beaver Creek HU. Upon implementation, the Blackfoot Non-winter Travel Plan preferred alternative would reduce hunting period density of open routes to 1.2 miles per square mile in the Beaver Creek HU and 1.0 mile per square mile in the Keep Cool Creek HU. If implemented before the Stonewall decision, then during project implementation alternatives 2 and 3 both result in a route density of 1.5 miles per square mile. Despite the reduction from the cumulative effect of the travel plan, Plan standard 4a continues to not be met due to the low hiding cover values in the project area.

Hunting Season Elk Security

The Blackfoot Non-winter Travel Plan preferred alternative includes a Forest Plan Amendment that changes the way big game security during the hunting season is calculated (Standard 4a). If implemented, this Forest Plan Amendment would analyze the security habitat within the Forest administrative boundary, and security areas would be at least 1,000 acres in size and greater than or equal to 0.50 mile from routes open to the public[27]. The Forest Plan programmatic amendment for big game is anticipated to improve the Forest's ability to effectively manage elk habitat during the hunting season. That analysis concluded that the elk security area methodology provides a reasonably accurate picture of elk security across the landscape, is responsive to proposed changes in open road patterns, and correctly directs management to areas that need further attention.

Forage/Calving Areas

Alternative 2, taken with activities that increase forage quality and quantity, results in forage improvement on 6,877 acres (21 percent) of the Beaver Creek HU and 3,364 acres (8 percent) of the Keep Cool Creek HU. Alternative 3 results in 6,187 acres (19 percent) forage improvement in the Beaver Creek HU and 2,703 acres (6 percent) in the Keep Cool Creek HU. Increased forage would result in improved and more widespread forage and calving opportunities in this landscape.

Summary

Cumulatively, approximately 3,362 acres of hiding cover and 381 acres of thermal cover would be removed under alternative 2. Under alternative 3 changes would be less than alternative 2. Hiding cover would be reduced by 2,217 acres, while thermal cover would decrease by 300 acres. With implementation of the Blackfoot Non-winter Travel Plan, open road density (hunting season) would be reduced from the existing condition both during and post-implementation; although, due to lack of hiding cover Forest Plan standard 4a would not be met, while elk security would increase above the existing condition.

Irreversible and Irretrievable Commitments

The action altenatives do not result in the loss of future options for the project area or the loss of production, harvest, or use of natural resources, therefore there are no irreversible or irretrievable commitments anticipated.

[27] This definition has been used for the security analysis in the Stonewall project.

Alternatives 2 and 3 Conclusions and Determination

Alternative 2

Treatments proposed under alternative 2 would reduce elk hiding cover in both herd units, and thermal cover in Keep Cool Creek HU, whereas treatments would increase forage on summer, winter and transition range. Neither unit would meet Forest Plan standard 3 or 4a. Hunting opportunities would be maintained and based on the analysis presented above and the following rationale, adequate elk habitat would continue to be available within both units to support desired levels of elk.

- Implementation would increase elk forage on 10,241 acres (13 percent) of summer, transition and winter range, maintain 90 percent of the existing summer range hiding cover, 74 percent of the existing winter range thermal cover and meet elk management unit objectives of using prescribed fire to improve elk habitat and maintain elk security (MFWP 2005 page 117).
- There would be no increase in public access during or post-implementation.
- While there would be short-term changes in elk security during implementation, 87 percent of the existing security habitat would be unaffected and there would be no long-term changes in elk security. The short-term changes in elk security would be mitigated by restricting operations to only one drainage at a time (project design feature WL-14 Elk). Cumulatively there would be an increase in elk security from the Blackfoot non-winter travel plan due to a reduction in miles of open road.
- Past wildfires have reduced project area elk habitat and much of the remaining habitat is at risk. Implementation of alternative 2 would reduce future wildfire risk.
- It is believed that active management is necessary to address fuel loading, species diversity and insect and disease concerns. Collectively, the treatments proposed under this alternative are designed to address these concerns and the long-term benefits associated with the increased diversity and reduced wildfire risk, are believed to outweigh the risks associated with the anticipated reduction in cover.
- Despite habitat effectiveness numbers less than 50 percent, elk population numbers are at objective within hunting district 281.

Alternative 3

Treatments proposed under alternative 3 would reduce elk hiding and thermal cover in both herd units, whereas the amount and distribution of forage would increase. Neither unit would meet Forest Plan standard 3 for thermal cover, or 4a, and Keep Cool Creek HU would not meet Plan standard 3 for hiding cover. Nine acres of elk security would be affected. Hunting opportunities would be maintained and based on the analysis presented above and the following rationale, adequate elk habitat would continue to be available within both units to support desired levels of elk.

- Implementation would increase elk forage on 8,890 acres (12 percent) of summer, transition and winter range; maintain 93 percent of the existing hiding cover, 80 percent of the existing thermal cover and meet elk management unit objectives as described for alternative 2 (MFWP 2005).
- There would be no increase in public access during or post-implementation.
- While there would be short-term changes in elk security during implementation, most of the existing security habitat would be unaffected and there would be no long-term changes in elk security. Cumulatively there would be an increase in elk security from the Blackfoot non-winter travel plan due to a reduction in miles of open road.
- Past wildfires have greatly reduced project area elk habitat and existing habitat is at risk. Implementation of alternative 3 would reduce future wildfire risk.

- It is believed that active management is necessary to address fuel loading, species diversity and insect and disease concerns. Collectively, the treatments proposed under this alternative are designed to address these concerns and the long-term benefits associated with the increased diversity and reduced wildfire risk, are believed to outweigh the risks associated with the anticipated reduction in cover
- Elk population numbers are at objective within hunting district 281.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Elk are a management indicator for commonly hunted species; as such they are intended to be a bellwether of the effects of management activities on representative wildlife habitats with the objective of ensuring that viable populations of existing native and desirable nonnative animal species are maintained.

Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA), the Forest Service Manual, and the Helena National Forest Plan. The NFMA requires the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" [16 USC 1604(g)(3)(B)]. All alternatives are consistent with this requirement. Elk habitat would continue to be abundant and well-distributed and species' viability would be maintained across the Forest.

Forest Plan Consistency

Forest Plan Standard 3: Using the MFWP definition**,** Forest Plan Standard 3 (Forest Plan II/17) requires that elk summer range will be maintained at 50 percent or greater hiding cover. Under alternative 1, the Beaver Creek unit would meet plan standard 3 and the Keep Cool Unit would continue to fall below plan thresholds. Both action alternatives would remove additional hiding cover. Under alternative 2 neither the Beaver Creek HU nor the Keep Cool Creek HU would meet standard 3 for hiding cover. Under alternative 3 the Beaver Creek HU will retain 51 percent hiding cover, whereas and Keep Cool Creek HU would continue to fall below 50 percent cover. This situation is addressed in a separate site-specific Forest Plan amendment.

Plan standard 3 requires that elk thermal cover be provided on 25 percent of the winter range within each herd unit. Both the Beaver Creek and Keep Cool Creek herd units would remain below this threshold under all alternatives and thermal cover would be removed under alternatives 2 and 3. This situation is addressed in a separate site-specific Forest Plan amendment.

Forest Plan Standard 4(a): Forest Plan Standard 4(a) (Forest Plan II/17-18) requires that an aggressive road management program be implemented to maintain or improve big game security. Specifically, road management will be implemented to at least maintain big game habitat capability and hunting opportunity, which is measured by the relationship between hiding cover and open road densities. Due to existing high open road densities and reduced levels of hiding cover, alternative 1 would not meet Standard 4(a). While open road densities would be unchanged, due to reductions in hiding cover, both action alternatives would move further away from the plan threshold. This situation is addressed in a separate site-specific Forest Plan amendment.

Forest Plan Standard 4(b): Forest Plan standard 4(b) requires that elk calving grounds and nursery areas be closed to motorized vehicles during peak use by elk. This is usually from late May through July. If elk calving and nursery areas are identified prior to or during project implementation, these areas would be protected under all alternatives (project design feature WL-13 ELK).

Forest Plan Standard 4(c): Forest Plan standard 4(c) (Forest Plan II/18) requires that all winter ranges be closed to vehicles between December 1 and May 15, with the exception of access through winter range to facilitate land management on other lands. Logging activities would be scheduled outside of the winter on winter range to address this standard, although hauling on roads through winter range may occur. All alternatives comply with Standard 4(c).

Forest Plan Standard 5: On elk summer range the minimum size area for hiding cover will be 40 acres and the minimum size area on winter range for thermal cover will be 15 acres. All analysis of hiding and thermal cover complied with these minimum size limits, as described in methodology. All alternatives comply with Standard 5

Forest Plan Standard 6: Forest Plan standard 6 (Forest Plan II/19 and C/1 - 11) requires the recommendations embodied in the Montana Cooperative Elk-Logging study (appendix C of the Forest Plan) be followed during timber sale and road construction projects. There are a total of eleven recommendations some of which have been incorporated as project design features. The following describes the project's consistency with each of the eleven recommendations.

1. *Security during logging operations* – All action alternatives are consistent with this recommendation. Design features have been incorporated that confine logging to a single drainage at a time to minimize disturbance to elk (WL-14 Elk). Also, logging activities would be completed in the shortest time frame possible. Use of firearms would be prohibited for anyone working within an area closed to the general public (WL-18 Elk).
2. *Redistribution of elk* –This recommendation is intended to plan timber sales in a manner that does not redistribute elk onto adjacent or nearby property. While elk movement will change during treatment, both action alternatives restrict timber harvest to a single drainage at a time to reduce displacement of elk and continue to restrict public access. It is not expected that changes in elk movement would result in impacts to private land.
3. *Traditional home range use by elk* – This recommendation is intended to ensure that timber harvest and road construction are planned to minimize impacts to elk and elk hunting. All action alternatives are consistent with this recommendation since all constructed roads would be closed to the public during logging operations and decommissioned post-implementation. Also there would be no changes in public access during or post implementation.
4. *Road construction and design* – This recommendation is intended to maintain the integrity of elk movement patterns and provide security for unimpeded movement. There are slight decreases in elk security during treatment and there would be no reduction in security following implementation. All constructed roads would be closed to the public during implementation and decommissioned afterwards.
5. *Road management* – This recommendation is also intended to maintain elk security through management of road densities. Implementation of Alternatives 2 and 3 would result in a short-term (5 years or less) increase in road density during implementation. New roads would not be opened to the public. Elk security would be maintained over the long-term and both alternatives are consistent with this recommendation.
6. *Area closures during the hunting season* – This recommendation is intended to ensure that travel restrictions are carefully considered relative to elk management objectives so that hunting opportunities aren't unnecessarily impacted. There would be no changes in travel restrictions under any alternative and secure areas will continue to be available.
7. *Clearcuts* – This recommendation is intended to ensure that forage produced through clear-cutting is available to elk. The action alternatives are consistent with these considerations since slash be no taller than 1.5 feet in regeneration harvest units (project design feature WL-19 Elk), and there would be no change in public access. Opening size limitations of 100 acres will be met.

8. *Cover type* – This recommendation is intended to ensure that cover types, important to elk, are considered during planning and implementation of silvicultural practices. The action alternatives are consistent with this recommendation since cover type data is available Forestwide (via R1-VMap) and was used to identify and assess cover and forage.
9. *Moist sites* – This recommendation is intended to ensure that the integrity of moist sites is maintained since these areas comprise important components of elk habitat. All action alternatives are consistent with this recommendation and wetlands, riparian areas, and elk wallows would be buffered and protected during implementation (project design feature WL-15 Elk).
10. *Elk/cattle relationships* – This recommendation is intended to ensure that forage may be created as a result of timber harvest remain available to elk. All action alternatives are consistent with this as grazing patterns or use would be modified if necessary to protect highly preferred forage species (project design feature WL-11 Vegetative Diversity).
11. *Winter range* – This recommendation states that timbered areas adjacent to primary winter foraging areas should be managed to maintain the integrity of cover, and timber harvest should be scheduled outside of the winter period. All action alternatives are consistent with this recommendation since there would be no winter logging in elk winter range and forested areas would remain adjacent to forage areas following treatment (figure 95 and figure 96).

Management Area T-2 Standards. *Maintain adequate thermal cover and hiding cover adjacent to forage areas. Generally this means providing 25 percent thermal cover on identified winter range*. Both alternatives 2 and 3 reduce the existing thermal cover from 13 percent (total at the Beaver Creek herd unit scale; 17% at the project scale) to 6 percent. Both action alternatives would move further away from Management Area T-2 Forest Plan thermal cover thresholds. This situation is addressed in a separate site-specific Forest Plan amendment.

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested. As described under the effects section, several units in each alternative are adjacent to openings that do not provide hiding cover. This situation is addressed with a site-specific Forest Plan amendment.

Schedule sale activities outside the winter periods (December 1 to May 15). Winter logging will not be allowed in elk winter range and all alternatives comply with this standard.

Management Area T-3 Standards. *Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game summer habitat.* All alternatives comply with this standard as new roads would be closed to public use and decommissioned following implementation and prescribed fire would improve forage diversity and production in big game summer ranges.

Maintain 50 percent hiding cover (MFWP definition) for big game. Alternative 2 would reduce hiding cover to 76 percent of the management area in the project area. Alternative 3 would reduce hiding cover to 81 percent of the management area in the project area. Both action alternatives are consistent with the Management Area T-3 hiding cover standard.

Maintain thermal cover adjacent to forage areas. Thermal cover is adjacent to forage areas and will be slightly reduced by both alternatives on the Beaver Creek HU. The action alternatives comply with standard.

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested. As described under the effects section, several units in each alternative are adjacent to openings that do not provide hiding cover. This situation is addressed with a site-specific Forest Plan amendment.

Management Area W-1 Standards. *Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game summer habitat.* All alternatives comply with this standard as new roads would be closed to public use and decommissioned following implementation and prescribed fire would improve forage diversity and production in big game summer ranges

Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing 25 percent thermal cover, where available, on identified winter range. Existing thermal cover in this management area is 22 percent. Although thermal cover is below the Forest Plan standard of 25 percent for management area W-1, none of the action alternative will alter the existing level of thermal cover.

Mule Deer

Effects Common to All Alternatives

Untreated portions of the project area would continue to progress through succession regardless of the alternative. Disturbance processes including climate change, insect infestations, disease, and fire would continue to influence the project area. At any given time, the project area would comprise a variety of successional stages. Hiding and thermal cover would continue to be reduced by mountain pine beetle-related mortality, whereas forage would increase.

Old-growth stands provide both thermal benefits and snow interception because of their structure and canopy cover (Kirchhoff and Schoen 1987). As a result, deer expend less energy travelling through shallower snow in these stands and they find more rooted forage that remains snow free (Parker et al. 1984). No designated old growth would be affected under any action alternative.

Alternative 1

Direct and Indirect Effects

There are no activities proposed under this alternative, so there are no direct effects anticipated to mule deer. Indirect effects are similar to those described for elk. Decades of fire suppression have resulted in increased stocking and closed canopied mature forest with reduced levels of forage and increased cover (Hayden et al. 2008). With the exception of areas affected by MPB mortality, these cover and forage conditions would be unchanged. Forage would increase on lands affected by MPB mortality, although cover would decline as trees fall to the ground. Within shrub and grassland habitats, continued conifer encroachment would increase cover and decrease forage.

Overall there would be little change in existing mule deer habitat under this alternative during the analysis period. Hiding cover would continue to be available across the project area and Plan defined thermal cover would remain low. While thermal cover in stands affected by MPB mortality would continue to decline, as described under elk, closed canopy mixed conifer stand would continue to be available. There would be no change in roads or public access and vulnerability to hunting would be unchanged. Due to continued fire suppression and elevated levels of fuels, the risk of larger, high intensity wildfire would be greatest under this alternative.

Cumulative Effects

Cumulative effects to mule deer are evaluated across the project area. Anticipated cumulative effects are in volume 2, appendix C. Past activities have shaped the age class, density and species composition of mule deer habitat that makes up the project area today and effects of these activities are reflected in the existing condition. Ongoing and future effects include continued grazing on approximately 5,100 acres, campground rehabilitation, almost 300 acres of NNIS treatment, 309 acres of hazard tree removal, fire wood collection, stream habitat improvement, and approximately 5 miles of trail maintenance/reconstruction. In total, approximately 4,100 acres or 17 percent of the analysis area would be affected. Streamside improvement, campground rehabilitation and trail work is expected to result in short-term disturbance during treatment and localized changes in habitat, although overall mule deer habitat would remain largely unchanged. Treatments that might result in habitat changes that include invasive plants treatment, hazard tree removal, firewood collection and wildfire (since 2011), which are displayed in the following table.

Table 127. Alternative 1 mule deer cumulative effects

Activity	Total Acres Affected	Hiding Cover Affected (acres)	Thermal Cover Affected (acres)
Grazing	5,172	4,204	805
Hazard Tree Removal	309	232	8
NNIS Treatment	292	189	20
Wildfire	10	9	0

Effects on grazing and NNIS treatment are expected to be similar to those described under elk, and while there would be localized reductions in forage, existing cover and forage would be maintained on sites affected by grazing. Disturbance associated with invasive plants treatment would be short term, and treatment would be expected to help maintain native mule deer forage.

Mule deer hiding and thermal cover would be reduced on 241 acres and 8 acres, respectively, due to hazard tree removal and wildfire and there would also be a localized reduction in cover in areas with concentrated MPB mortality. Firewood collection along open roads would continue. Deer cover would be reduced on sites affected by MPB mortality within the next five to ten years, whereas forage on many of the affected sites would increase. Over 98 percent of the existing hiding/winter range thermal cover would be maintained under this alternative.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated. Irretrievable commitments include a continued reduction in deer forage.

Alternative 1 Determination and Conclusions

Although there would be continued mountain pine beetle mortality, generally cover would be maintained or increase and forage would remain low. Public access and hunting pressure would be unchanged, and the risk of stand-replacing wildfire would remain high.

Alternatives 2 and 3

As described under affected environment, the entire project area is considered deer habitat. Hiding cover occurs on approximately 19,000 acres or 79 percent of the project area, whereas winter range thermal cover occurs on approximately 500 acres. Deer cover affected by treatment is displayed in table 127.

Table 128. Treatments within deer hiding cover by alternative

Treatment	Deer Hiding Cover Treated				Deer Winter Range Thermal Cover Treated			
	Alternative 2		Alternative 3		Alternative 2		Alternative 3	
	Acres	%[1]	Acres	%[1]	Acres	%[1]	Acres	%[1]
Intermediate Harvest[5]	1,711	9	806	4	56	11	59	12
Regeneration Harvest[3]	847	4	723	3	0	0	0	0
Low Intensity Burn[2]	314	3	734	5	20	4	20	4
Jackpot Burn	0	0	321	2	0	0	0	0
Mixed Severity Burn[2,4]	3,351	22	1,999	13	144	29	75	15
Total	**6,223**	**33**	**4,583**	**24**	**220**	**44**	**154**	**31**
Reduction in Cover	**3,538**	**15**	**1,980**	**8**	**92**	**19**	**78**	**16**
Post-Treatment Cover	**15,501**	**81**	**17,058**	**90**	**400**	**81**	**414**	**84**

[1] – percent of available cover.
[2] – Assumes 20 percent of the site would be unburned
[3] – Cover would be reduced
[4] – Cover would be reduced on lands affected by high intensity fire or 25 percent of acres affected
[5] – Reduction in thermal cover, hiding cover reduction variable

Direct and Indirect Effects

Effects are expected to be similar to those described for elk, although deer are evaluated across the project area. Deer are highly mobile and there is no mortality anticipated. Treatment would displace deer during implementation and changes in cover and forage would continue to alter movements following treatment. Project design features would reduce effects during implementation by limiting harvest to specific portions of the project area at a time and restricting public access.

Effective mule deer reproductive habitat (fawning and lactation periods) generally is located at intermediate elevations in diverse, mesic montane forests with dependable sources of succulent, high quality forage. Timber harvest and burning in all action alternatives would reduce cover rendering some areas unsuitable as fawning habitat until the understory regenerates. Unaffected uneven-aged stands would continue to be available at mid to lower elevations to provide a mosaic of high quality forage and security for fawn rearing, whereas the mosaic of cover and forage created through burning would improve habitat.

Indirect effects and changes in habitat conditions would be similar to those discussed for elk. Deer hiding cover would be reduced by 3,538 acres under alternative 2 and 1,980 acres under alternative 3, whereas winter range thermal cover would be reduced by 92 acres and 78 acres under alternatives 2 and 3 respectively. Effects on cover and forage would vary by treatment type. There would be a long-term loss of cover on lands affected by regeneration harvest and openings created by mixed severity fire. Effects of intermediate treatment would be variable. All sites would have a reduction in thermal cover, whereas cover would only be reduced on sites where the residual canopy cover is reduced below 40 percent. Because most intermediate treatments under alternative 3 would maintain 40 percent canopy closure and mixed severity burning is reduced, alternative 3 maintains more hiding cover. Currently hiding cover exists on 19,039 acres of 78 percent of the project area. Under alternative 2, cover would be reduced to 15,501 acres (65 percent) whereas hiding cover would be retained on 17,058 acres (71 percent) under alternative 3. While scattered overstory mortality would occur during low severity burning, canopy and hiding cover would be maintained. Burning would reduce understory cover, although treatment sites would have a mosaic of burned and unburned lands.

As described under treatment effects, proposed regeneration harvest, intermediate treatments and burning are expected to increase available deer forage (Regelin and Wallamo 1978), although this increase would by over time and by treatment. While intermediate harvest and burning would increase forage for up to 10 or 12 years, regeneration harvest can maintain elevated levels of forage for over 20 years (Wallmo et al. 1972; Collins and Urness 1983 in Hayden et al. 2008). Like elk, forage availability for deer depends on the proximity of the created forage to cover, and Hayden et al. (2008) suggests that deer forage should be within 600 feet of cover. Because burn units would have a mosaic of treated and unburned lands and with retention of cover on lands adjacent to recent clearcuts, it is likely that most of the forage created would be close enough to cover to be utilized. Proposed burning can also increase palatability and use. While preferences vary seasonally, increased deer use has been documented in burned areas and prescribed fir can improve winter habitat (Gruell 1986 in USDA Forest Service 2011b, Hobbs and Spoward 1984).

The size of openings created by burning is also a consideration. Hayden et al. (2008) recommends maintaining or improving a matrix of forage conditions across the landscape with emphasis on increasing the variety of forage plants available and a mixture of shrub age classes. They also recommend that small openings of less than 50 acres on summer range and less than 10 acres of winter range be encouraged or maintained. Because most of the burning would be low-severity burning or mixed-severity burning that creates openings less than 10 acres in size, forage created would be available.

In summary, while there would be changes in deer cover and forage, both action alternatives would maintain over 80 percent of existing hiding, increase stand and landscape level forage and create a mosaic of cover and forage conditions preferred by deer.

Impacts of roads on mule deer, especially during the hunting season have been well-documented (Thomas 1979, Hayden et al. 2008). Both alternatives propose roads to be built then obliterated immediately following timber removal. While they would increase walk in hunter access, roads would be closed during implementation and unroaded areas would not be affected. As a result there are no long-term changes in hunter access or road disturbance is anticipated and security during the hunting season will continue to be provided by well-distributed patches of cover and limited road access.

Cumulative Effects

Proposed treatments would contribute to past, on-going and future activities discussed under alternative 1 and include 309 acres of hazard tree removal, 292 acres of invasive weed treatment, 10 acres of recent wildfire and up to (alternative 2) 3,099 acres of timber harvest and 5,463 acres of prescribed burning.

Cumulatively treatments would affect approximately 6,223 acres of hiding cover and 220 acres of winter range thermal cover, and the changes in cover and forage would affect deer distribution and use. There would be no change in public access, new roads would be obliterated following treatment and there are no long-term changes in hunter access or security habitat. While forage would be increased on sites treated, the project area would become more open while stands regenerate and understories develop. Hiding cover could be reduced from 78 percent to 64 percent of the project area, whereas approximately 80 percent of the existing thermal cover would be maintained.

As described under alternative 1, changes resulting from MPB mortality would continue including a reduction in cover and increase in forage on sites affected. While cattle would be attracted to treatment sites, use is not expected to change and with implementation of PDF’s grazing modifications would be made if necessary to reduce impacts. Disturbance associated with recreational activity would continue, although use is not expected to change.

Irreversible and Irretrievable Commitments

There are no irreversible commitments anticipated. Irretrievable commitments include a reduction in hiding and thermal cover, as well as reduced forage greater than 500 feet from cover; however, forage would be improved both in the short and long term, and hiding and thermal cover would be restored on all sites treated.

Determination and Conclusions

Treatments proposed under alternatives 2 and 3 would reduce deer hiding and thermal cover and increase deer forage. Based on the analysis presented and the following rationale, cover and forage would continue to be available to support existing populations.

- ♦ Implementation would increase the amount, diversity and quality of forage on summer, transition and winter range.
- ♦ Mule deer cover would be maintained across the project area and a mosaic of cover and forage conditions would be provided across the landscape.
- ♦ Existing hunter access would be unchanged, old growth and security areas would be maintained.
- ♦ Implementation would reduce wildfire risk and restore fire to the landscape.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Mule deer habitat would remain relatively unchanged under alternative 1. While deer use may be altered by treatment under the action alternatives, cover and forage would be maintained in the short term and improved over. All alternatives are in compliance with Forest Plan (USDA Forest Service 1986) direction to maintain and improve habitat over time to support big game and other wildlife (II-1), develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs (p. II/2), and ensure that viable populations of existing native and desired nonnative species are maintained (p. II/17). All alternatives are consistent with National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604((g)(3)(B)); also see 36 CFR 219.10(b): and FSM 2670.12.

Compliance with Forest Plan Standard 8

Forest Plan standard 8 (Forest Plan II/19) requires that any proposed sagebrush reduction programs will be analyzed on a case-by-case basis for possible impacts on big game winter range. The action alternatives have been analyzed to determine the impacts of prescribed burning in sagebrush. The analysis has indicated that although some sagebrush would be removed through burning, a sagebrush component would be retained on all sites. Also, over time sagebrush vigor and forage quality would be improved and, as such, be beneficial to mule deer.

Management Areas

There are six Management Areas within the project area; of those, three Management Areas contain direction relevant to mule deer habitat:

Management Area T-1

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat - All roads to be constructed would be closed to public use and obliterated following implementation. Prescribed fire goals include improving forage diversity and production in big game winter ranges.

Maintain adequate thermal cover and hiding cover adjacent to forage areas – Both alternatives would increase forage and remove cover. Considering that 80 percent or more of the existing management area cover would be maintained, that unaffected lands would occur in all burn units, and that cover would be maintained adjacent to regeneration harvest, adequate cover will be maintained adjacent to forage and both alternatives comply with this standard.

Management Area T-2

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat – All new roads would be closed to public use and decommissioned following implementation. Prescribed fire goals include improving forage diversity and production in big game winter ranges.

Maintain adequate thermal cover and hiding cover adjacent to forage areas. Generally this means providing 25 percent thermal cover on identified winter range – Winter range thermal cover is provided on 78 acres of 12 percent of the management area winter range. Due to the open stand conditions that characterize the project area, management area T-2 winter range does not currently provide 25 percent thermal cover. Both action alternatives would reduce winter range thermal cover by up to 56 acres and move further away from Forest Plan thresholds. This situation will be addressed in a separate site-specific Forest Plan amendment.

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested – There are treatment units next to existing plantations that currently do not provide hiding cover. . These units and adjacent plantations have been surveyed and where necessary buffers will be retained between those areas in order to provide some level of cover between past and proposed treatment units. Buffers would be at least 200 feet wide, although they may be wider if field data indicates that this is necessary.

Management Area T-3

Maintain 50 percent hiding cover (MFWP definition) for big game – There are currently 4,840 acres (74 percent of the management area) of big game hiding cover. While the action alternatives would reduce existing hiding cover by up to 853 acres, hiding cover would be retained on over 82 percent of the lands within management area T-3.

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat – All new roads would be closed to public use and decommissioned following implementation. Prescribed fire goals include improving forage diversity and production in big game winter ranges.

Maintain adequate thermal cover and hiding cover adjacent to forage areas – Both alternatives would increase forage and remove cover. Considering that 85 percent or more of the existing management area cover would be maintained, that unaffected lands would occur in all burn units, and that cover would be maintained adjacent to regeneration harvest, adequate cover will be maintained adjacent to forage and both alternatives comply with this standard.

Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested – There are treatment units next to existing plantations that currently do not provide hiding cover. These units and adjacent plantations have been surveyed and where necessary buffers will be retained between those areas in order to provide some level of cover between past and proposed treatment units. Buffers would be at least 200 feet wide, although they may be wider if field data indicate that this is necessary.

Management Area W-1

Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat – All new roads would be closed to public use and decommissioned following implementation. Prescribed fire goals include improving forage diversity and production in big game winter ranges.

Maintain adequate thermal cover and hiding cover adjacent to forage areas – Both alternatives would increase forage and remove cover. Approximately 85 percent or more of the existing management area cover would be maintained, unaffected lands would occur in all burn units, and project design features will retain cover adjacent to regeneration harvest. As a result, adequate cover will be maintained adjacent to forage and both alternatives comply with this standard.

Helena National Forest Land and Resource Management Plan Non-Significant, Site-Specific Forest Plan Amendment

Amendment

The Helena National Forest is amending the 1986 Helena National Forest Plan (Forest Plan) for lands encompassed by the Stonewall Vegetation Project. This site-specific amendment would exempt the Project from:

- Forestwide Standard 3 for hiding cover on summer range (Forest Plan p. II/17) for the Beaver Creek and Keep Cool Creek elk herd units and thermal cover on winter range in the Beaver Creek herd unit
- Forest-wide Standard 4a for open road densities during the big game hunting season (Forest Plan p. II/17-18) for the Beaver Creek and Keep Cool Creek elk herd units
- Management Area T-2 standard for thermal cover on winter range (Forest Plan p. III/35) within the management area
- Management Area T-2 and T-3 standards for hiding cover in timber harvest openings (Forest Plan III/35 and III/39).

The hiding cover and thermal cover standards in Management Area W-1 (Forest Plan p. III/50) are not subject to an amendment because the project will not alter cover in this management area. The amendment is a site-specific amendment and is applicable only to implementation of the decision for the Stonewall Vegetation Project. This is a one-time exemption and is not intended to replace the existing standards.

Background

Elk serve as a management indicator for hunted species for the Helena National Forest (Forest Plan p. II/17). Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA) as well as the Forest Plan. The NFMA requires the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” [16 USC 1604(g) (3) (B)]. Forest Plan Standards are in place to ensure that this requirement is satisfied.

The Forest Plan contains Forestwide big game standards and standards specific to each of the management areas identified in the Forest Plan. The standards that are the subject of this site-specific amendment are:

- **Forestwide Standard 3** – *Subject to hydrologic and other resource constraints, elk summer range will be maintained at 35 percent or greater hiding cover and areas of winter range will be maintained at 25 percent or greater thermal cover in drainages or elk herd units.*
- **Forestwide Standard 4** – *Implement an aggressive road management program to maintain or improve big game security.*
    - *b. Road management will be implemented to at least maintain big game habitat capability and hunting opportunity. To provide for a first week bull elk harvest that does not exceed 40 percent of the total bull harvest, roads will be managed during the general big game hunting season to maintain open road densities with the following limits.*

The existing hiding cover to open road density ratio should be determined over a large geographic area, such as a timber sale analysis area, a third order drainage, or an elk herd unit.

Table 129. Forest Plan hiding cover/road density

Existing Percent Hiding Cover (1)	Existing Percent Hiding Cover (2)	Max Open Road Density mi/mi^2
56	80	2.4
49	70	1.9
42	60	1.2
35	50	0.1

(1) Forest Service definition - a timber stand which conceals 90 percent or more of a standing elk at 200 feet;
(2) MT Fish, Wildlife, & Parks definition - a stand of coniferous trees having a crown closure of greater than 40 percent.

- **Management Area T-2 Standards** – *Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent thermal cover on identified winter range. Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested.*
- **Management Area T-3 Standards** –*Openings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.*

The hiding cover analysis utilizes the Montana Department of Fish, Wildlife, and Parks (MFWP) definition included in the Helena National Forest Plan (p. II/18): a stand of coniferous trees having a crown closure of greater than 40 percent. The 40 percent canopy cover metric is an acceptable ‘proxy’ for mapping hiding cover as it is generally assumed that stands with 40 percent canopy cover or greater would in turn provide adequate vertical structure that would hide 90 percent of an elk at 200 feet, the functional definition of hiding cover (Black et al. 1976). This relationship of canopy cover and stand structure is based on modeling done by Lonner and Cada (1982) and others (e.g. Leckenby et al. 1985, Thomas et al. 1988) who used canopy cover to predict the relationship between hiding cover (as estimated by canopy cover), road densities, and harvest rate the first week of the general hunting season.

Specifically, the parameters used to map hiding cover include polygons with greater than 40 percent canopy cover and greater than 40 acres in size (USDA 2009b). Timber harvest or other activities that affect vegetation and have occurred within the last 15 years are removed from consideration as hiding cover even if the canopy cover and patch size criteria are met. This is based on the assumption that the trees within these areas are not tall enough to hide elk. Therefore, though tree height is not a parameter used to map hiding cover, it is accounted for by removing from consideration as hiding cover, those stands where vegetation management has occurred in the last 15 years.

Canopy cover spatial data used to map hiding and thermal cover are derived from R1-VMap based in part on the following documents: Region 1 Existing Vegetation Map Products (VMap) Release 9.1.1 (USDA 2009a), the *R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System (USDA 2009b), and Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products* (USDA 2011). The analysis used the version of R1-Vmap that is available on the Forest based on 2005 imagery which does not reflect canopy loss and tree mortality associated with the mountain pine beetle outbreak that began around 2006.

The mountain pine beetle outbreak in the project area as well as in those herd units within which the project occurs has resulted in canopy cover losses in the lodgepole pine stands in the area. However, while these stands of trees remain upright they will continue to hide elk, despite losses in canopy cover (Figure 1). For this reason, the 2005 version of R1-VMap is assumed to accurately reflect current hiding cover despite the losses in canopy cover. This assumption has been validated by field data [see the Stonewall Elk Hiding Cover Synthesis/Management Area T2 and T3 Focus Report in the project record] as well as other studies that have relied on pre-disturbance vegetation characteristics to predict post-disturbance wildlife habitat (e.g. Russell et al. 2007, Nappi and Drapeau 2011, Latif et al. 2013). Furthermore, Smith and Long (1987) observed a well-defined relationship between elk hiding cover and high densities of lodgepole pine boles, conditions found in the project area.

In a study conducted on mountain pine beetle-killed lodgepole pine in Oregon, dead trees began falling five years after death in unthinned stands and 90 percent had fallen by year 14 (Mitchell and Preisler 1998). Fall rates of lodgepole pine killed by mountain pine beetle were slower in north-central Colorado (Klutsch et al. 2009); in British Columbia, 10 percent of dead trees were still standing 25 years later (Lewis and Hartley 2006). Rate of fall is influenced by tree size, soil moisture, climate, and the prevalence of windstorms, among other factors (Keen 1955). Trees in the project area that have been killed by the mountain pine beetle outbreak have generally been dead between 3 and 7 years. As such, standing dead trees should continue to provide functional hiding cover in the project area for several more years.

Figure 97 that follows, is an example of the hiding cover properties in dead/dying lodgepole pine. Hiding cover measurements were taken in this stand, which is primarily composed of dead/dying lodgepole pine. The cover board in the center of the photo is 200 feet away from the observer. Note that much of the cover board is obscured by standing dead trees.

Figure 97. Hiding cover properties in a dead and dying lodgepole pine stand

Montana has maintained the longest general elk-hunting season (5-weeks) of all western states; a tradition that has been in place for several decades. When the Helena National Forest Plan was crafted in 1986, Forestwide Standard 4(a) was established to facilitate that longer hunting season while maintaining and/or improving big game security that would ensure that elk populations post-harvest remained aligned with MFWP objectives (USDA 1986, pp. 11/17-18 and V/5). At that time, MFWP collected data to determine the percentage of bulls harvested during the first week of the general big game hunting season, as reflected in Standard 4(a). Montana Fish, Wildlife and Parks no longer collects those data to determine the percent of bulls harvested during the first week of the general rifle season. Rather, MFWP relies on bull to cow ratios measured through aerial survey trend counts[28]. These trends are used to determine harvest regulations that allow MFWP to achieve elk population objectives (MFWP 2005). As such, this analysis utilizes bull to cow ratios to determine if the project is aligned with the intent of Standard 4(a) – to maintain or improve big game security while providing for an extended hunting season. While the bull to cow ratio may be a different metric than was originally described in the Helena National Forest Plan, it reflects updated methodologies employed by MFWP to regulate elk populations.

[28] Each Elk Management Unit and/or Hunting District has population objectives that identify the desired bull/cow ratio post-harvest. Some HDs include either a desired bull/cow ratio or a desired percent of bulls in the post-harvest trend counts. Other HDs only specify a desired percent of harvest of brow-tined bulls. See MFWP (2005) for detailed information by EMU/HD. The HDs within which the Helena National Forest occurs include: 215, 280, 281, 293, 335, 339, 343, 380, 390, 391, 392, 455, and 446.

Management Area T-2 occurs “where big game range and timber values are present” (Forest Plan III/34). The management goals include providing for the maintenance and enhancement of big game winter range.

Management Area T-3 “consists of lands that have primary forage, resting, and security characteristics that provide important spring and summer requirements for all big game species” (Forest Plan III/38). The management goals include providing for the maintenance and/or enhancement of habitat characteristics favored by elk and other big game species.

Rationale

The project area includes two elk herd units (EHUs) that are the subject of this amendment: Beaver Creek- Lincoln and Keep Cool Creek, and two management areas: T-2 and T-3. The wildlife analysis for this project indicates that the existing condition for the Keep Cool Creek herd unit is below Forest Plan Standard 3 in terms of hiding cover and both herd units are below Forest Plan Standard 3 in terms of thermal cover. Both herd units are below Forest Plan Standard 4a. The existing condition in Management Area T-2 is below the thermal cover standard for the area. In addition, there are several past harvest units in management areas T-2 and T-3 that do not currently provide hiding cover requirements of big game that are adjacent to proposed harvest units. The project would result in the removal of hiding and thermal cover that would move these EHUs further away from consistency with Forest Plan Standard 3 and 4(a), and would further reduce thermal cover in Management Area T-2, and would treat areas adjacent to past harvest that do not currently provide hiding cover. The information used in this amendment is based on the wildlife analysis completed for the Stonewall Vegetation Project Environmental Assessment.

Table 129 summarizes the effects to hiding and thermal cover under the project relative to Forest Plan Standard 3. Under alternative 2 approximately 2,750 acres of hiding cover would be removed in the Beaver Creek herd unit which is an 8 percent reduction from the existing condition. Alternative 3 reduces the amount of harvest in the Beaver Creek herd unit and would remove 1,600 acres of hiding cover, or 5 percent. Approximately 360 acres of hiding cover would be removed in the Keep Cool Creek herd unit which is a 1 percent reduction from the existing condition under both alternative 2 and 3. Thermal cover in the Beaver Creek herd unit would be reduced by 355 acres (2 percent) under alternative 2 and 274 acres (1 percent) under alternative 3. There are no changes to thermal cover in the Keep Cool Creek herd unit under either action alternative.

Table 130. Forest Plan hiding and thermal cover on elk summer range by elk herd unit

Elk Herd Unit	Beaver Creek - Lincoln	Keep Cool Creek
Total Acres Summer Range	32,406	44,325
Forest Plan Hiding Cover[1] – Existing Condition Acres (%)	18,183 (56%)	15,607 (35%)
Forest Plan Hiding Cover[1] – Alternative 2 Acres (%)	15,513 (48%)	15,365 (35%)
Forest Plan Hiding Cover[1] – Alternative 3 Acres (%)	16,687 (51%)	15,336 (35%)
[1]In order to meet the definition of Forest Plan hiding cover, hiding cover patches must be at least 40 acres in size. The removal of hiding cover in treatment units would result in untreated patches that are less than 40 acres in size and therefore do not contribute to Forest Plan hiding cover and Big Game Standards 3 and 4(a).		
Total Acres Winter Range	17,787	13,754
Forest Plan Winter Range Thermal Cover[2] – Existing Condition Acres (%)	938 (5%)	527 (4%)
Forest Plan Winter Range Thermal Cover[2] – Alternative 2	583	527

Elk Herd Unit	Beaver Creek - Lincoln	Keep Cool Creek
Acres (%)	(3%)	(4%)
Forest Plan Winter Range Thermal Cover[2] – Alternative 3 Acres (%)	664 (4%)	527 (4%)
[2] To meet the definition of Forest Plan thermal cover, thermal cover patches must be at least 15 acres in size. The removal of thermal cover in treatment units would result in untreated patches that are less than 15 acres in size and therefore do not contribute to Forest Plan thermal cover Standard 3.		

Table 130 summarizes the effects to the hiding cover/open road density associated with the project for Standard 4(a). The open-road density associated with the project would remain the same as the existing condition post-treatment. Approximately 2.6 miles of temporary road would be constructed in the Beaver Creek herd unit followed by full obliteration post-treatment under alternative 2. An additional 11.7 miles of currently closed roads would also serve as haul routes in Beaver Creek herd unit. In alternative 3, 0.4 miles of temporary road would be constructed in the Beaver Creek herd unit followed by full obliteration post-treatment, with an additional 10.6 miles of closed roads serving as haul routes. These roads would be closed to the public. During project implementation the road density in Beaver Creek herd unit increases to 1.7 miles per square miles under alternative 2 and 1.6 miles per square mile under alternative 3.

Table 131. Post treatment elk herd unit data for hiding cover and open road density

Elk Herd Unit	Total Square Miles	Percent Forest Plan Hiding Cover Existing Condition	Open Road Density During Hunting Season	Percent Forest Plan Hiding Cover Post-Treatment Alternative 2	Percent Forest Plan Hiding Cover Post- Treatment Alternative 3	Meets Forest Plan Standard #4a
Beaver Creek - Lincoln	51	56	1.4	48	51	No-alternative 2 Yes-alternative 3
Keep Cool	70	35	1.3	35	35	No

Table 131 summarizes the effects to winter range thermal cover in Management Area T-2. In Management Area T-2, winter range thermal cover would be removed on 165 acres (59 percent) under both alternatives. Figure 98displays existing thermal cover in relation to proposed treatments in Management Area T-2. Figure 99 displays existing hiding cover in Management Area T-3 in relation to proposed treatments. In both management areas there are openings from past harvest that do not yet provide hiding cover. Two of these openings are within Management Area T-2, with 4 proposed units adjacent to the openings under each alternative. In Management Area T-3 there are 11 units adjacent to these openings under alternative 2, and 6 units adjacent to openings under alternative 3.

Table 132. Post treatment thermal cover data in management area T-2

Habitat/Plan Compliance	Existing Condition	Alternative 2	Alternative 3
T-2 Winter Range Thermal Cover Acres (%)	276 acres (13%) in the Beaver Creek HU; 251 acres (16%) within the project boundary	114 acres (6%) of which 89 acres (6%) are within the project boundary	114 acres (6 %) of which 89 acres (6%) are within the project boundary
Meets Plan Standard	No	No	No

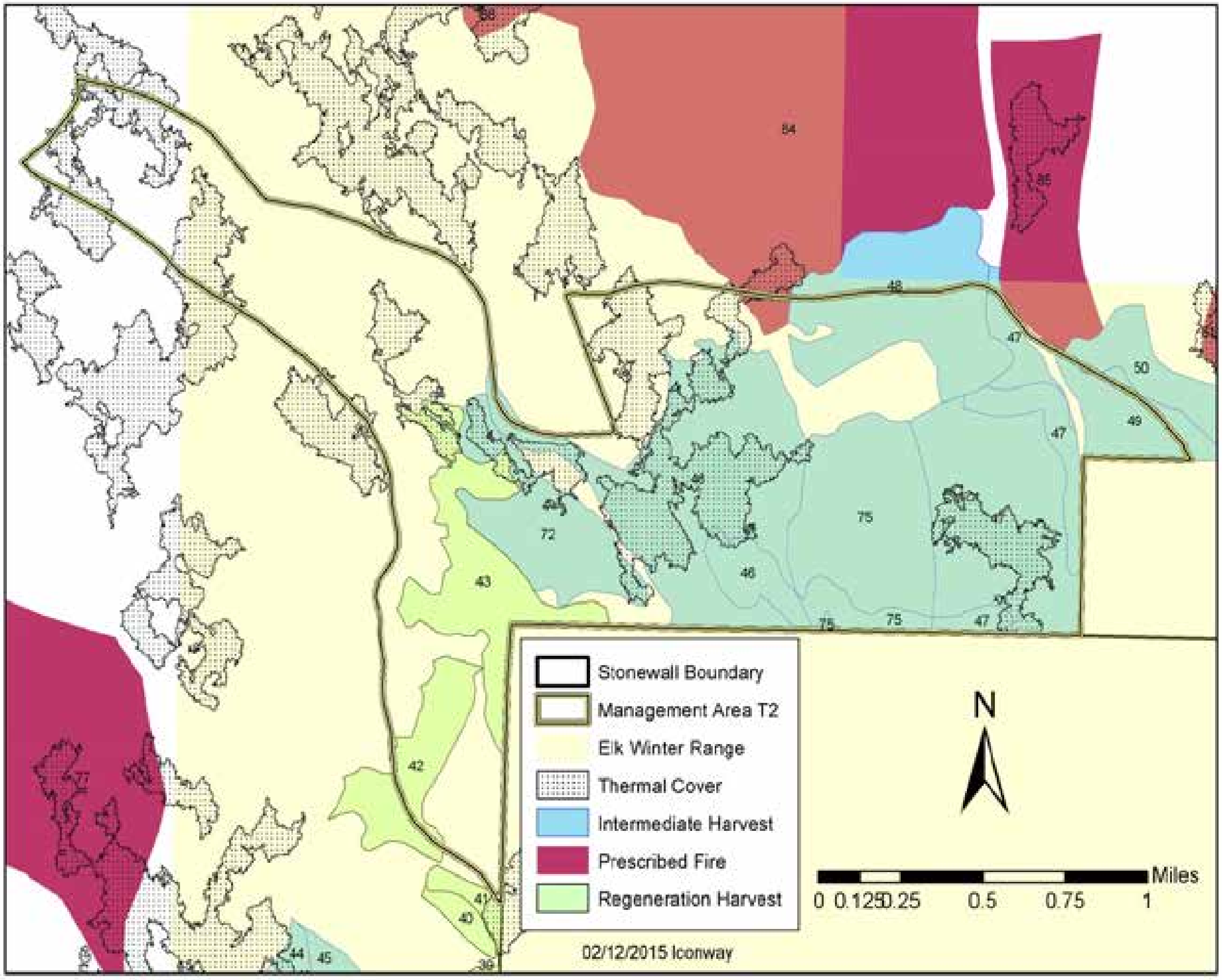


Figure 98. Management Area T-2 showing existing thermal cover on winter range and proposed Stonewall Project activities

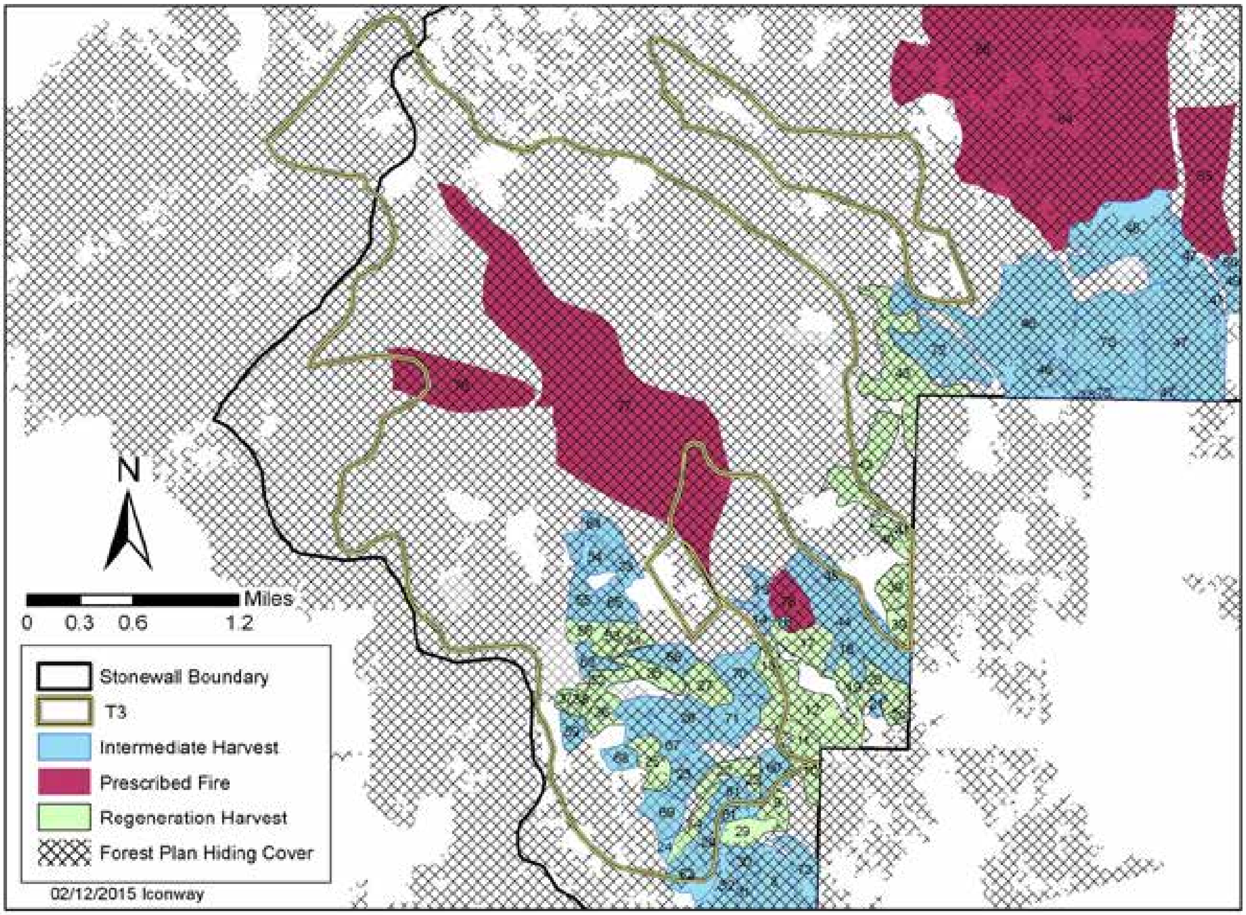


Figure 99. Management Area T-3 showing existing Forest Plan hiding cover and proposed Stonewall Project activities

Exempting this project from Standard 3 hiding cover and Standard 4(a) for both Beaver Creek – Lincoln and Keep Cool Creek EHUs, and Standard 3 thermal cover for the Beaver Creek herd unit, as well as the thermal cover standard in MA T-2 and the units adjacent to openings without hiding cover standard in MA T-2 and T-3, may affect elk to some extent due to the removal of hiding and thermal cover from these EHUs. The project would remove approximately 2,912 acres of hiding cover, or 9 percent of the existing under alternative 2, while alternative 3 results in 1,767 acres (5 percent) of hiding cover removed. Approximately 355 acres (24 percent) of existing thermal cover in the Beaver Creek herd unit would be removed under alternative 2, and 274 acres (19 percent) would be removed under alternative 3. Although elk use of the landscape would be altered, forage conditions would improve on the acres where cover is removed, and in areas where hiding cover is thinned, but not removed (intermediate harvest of 1,970 acres of hiding cover under alternative 2 and 1,345 acres under alternative 3) remaining hiding cover would be interspersed with forage.

Regardless of project implementation, this loss of cover would occur naturally over the next few years due to extensive tree mortality and natural tree fall associated with the mountain pine beetle infestation (Mitchell and Preisler 1998, Lewis and Hartley 2005, among others). Dead trees within treatment areas comprised of lodgepole pine would continue to fall at which time these areas would no longer provide hiding cover. However, the removal of hiding and thermal cover may be more beneficial for elk in the long run in terms of quickening the regeneration rate of new forests in the Beaver Creek and Keep Cool Creek herd units.

The project may also result in short-term disturbance to elk. However, project design features would be included to minimize these disturbances. These measures include: restricting public use of temporary roads and restricting logging operations to a single drainage at a time, among others.

The amendment to exempt this project from Standards 3 and 4(a) and the hiding and thermal cover provisions of management areas T-2 and T-3 should have minimal effect on overall elk populations. The two herd units that are the subject of this amendment are located in Hunting District (HD) 281 in the Bob Marshall Wilderness Complex Elk Management Unit (EMU) as defined in the state-wide Montana Elk Plan prepared by the Montana Fish, Wildlife, and Parks (MFWP) (See pages 104-129 in MFWP 2005). The Montana Elk Management Plan provides detailed information on the EMU relative to goals, objectives, and management challenges. Excerpts are presented in table 132.

Table 133. Elk populations and objectives

Elk Populations and Population Objectives for the Deer Lodge Elk Management Unit			
Elk Management Unit	**Hunting District**	**Elk Populations for the EMU**	**Population Objectives HD 281**
Bob Marshall Wilderness Complex	281	More than 80% of the elk observed in this EMU use Wilderness habitats during at least a portion of the year. Elk populations wintering in HD 281, 282, 282, and 285 are near modern day highs. The numbers of elk observed in HD481 has increased steadily since 1980, with over 700 elk observed in 2003.	During the post season aerial surveys: maintain 500-700 elk, with 150-200 elk in the Beaver-Keep Cool area; maintain less than 200 elk on private ranches in HD 281; maintain at least 15 bulls:100 cows, or 8% bulls among total elk observed.

Aerial surveys conducted by MFWP personnel within HD 281 indicate that elk numbers have been stable since 2001 and are currently at population objectives (table 133). Meanwhile, hiding and thermal cover has been relatively stable since 2000 in HD 281 as well as within the Project area until the recent mountain pine beetle outbreak. The mountain pine beetle outbreak in the project area has killed forested stands of primarily lodgepole pine. However, many of these trees are still standing and continue to provide hiding cover. This is expected to change over the next several years as dead trees fall. So, despite the status of elk hiding cover in the project area, elk populations have been generally stable in HD 281 (figure 100). This could be due to many factors including extensive use of Wilderness habitats by elk that winter in HD281, protection of elk habitat since 1992 with conservation easements, and control of noxious weeds in the EMU (MFWP 2005, pages 106-114).

Bull/cow ratios have been somewhat variable, ranging from 4 bulls/100 cows to 21 bulls/100 cows. The objective for the hunting district is a minimum of 15 bulls/100 cows. The ratio of calves/100 cows averaged 22 over the last 5 years, with 21 calves/100 cows counted in 2014. According to the Elk Plan, a Standard Regulation (6-week season and approximately 150 permits) is recommended in HD 281 if during the post-season aerial trend survey the number of elk is between 500 and 700 and more than 20 calves/100 cows are observed (MFWP 2005, page 122). Of the primary MFWP population parameters likely to be impacted by elk security habitat on the Helena National Forest (namely, total population numbers and bull/cow ratios), total numbers on average have met Montana Elk Plan objectives for the past several years. The project would make no changes that would influence this.

While many factors contribute to elk numbers, exempting the project from Standards 3 and 4(a), and hiding cover and thermal cover standards for Management Areas T-2 and T-3, should not preclude the ability of MFWP to realize its elk objectives in this HD.

Table 134. Elk populations 2001-2014

Year	Total Elk	Bulls/100 Cows	Calves/100 Cows
2001	635	-	-
2003	665	17	-
2005	748	21	-
2008	726	-	-
2009	-	-	-
2010[1]	488	4	34
2011	560	13	20
2012	705	6	19
2013	452	7	17
2014	651	14	21
Late Winter Count Objectives	500-700 elk	≥15 bulls/100 cows	

[1] – poor flight conditions and timeliness likely resulted in an undercount of both total elk and bulls

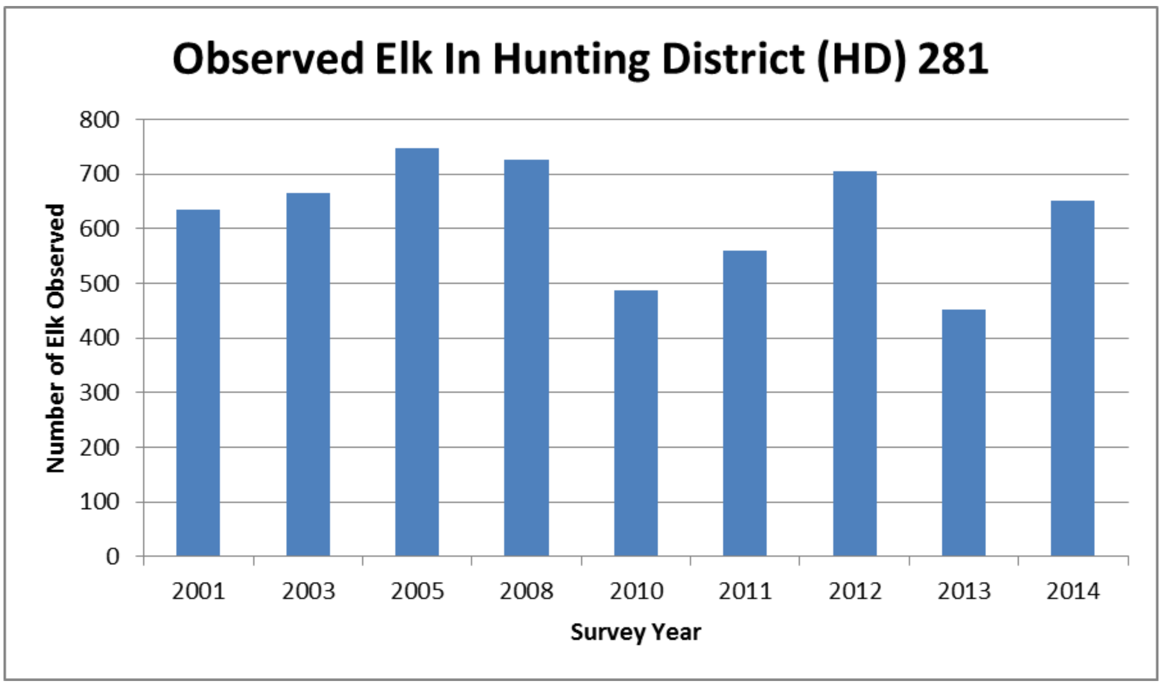


Figure 100. Numbers of elk observed in Hunting District 281 from 2001-2014

Exempting this project from Standards 3 and 4(a), and hiding cover and thermal cover standards for Management Areas T-2 and T-3, should not affect the Forest's ability to realize the elk population potential established in the Forest Plan. When the Forest Plan Record of Decision was signed in 1986, the selected alternative was E-1. Alternative E-1 established Forestwide elk population potential for summer and winter range. In 1986, the Forest Plan summer range elk potential was 6,300 elk; the winter range elk potential was 4,000 elk. By decade 5, summer range elk potential in the Forest Plan was projected at approximately 6,200 elk and winter range elk potential at 3,200 elk (Forest Plan Record of Decision page 13, Forest Plan FEIS pages II/56-60). Based on aerial survey data collected by MFWP staff in 2014, there are over 15,036 elk Forestwide within those hunting districts that overlap with the Helena National

Forest. Some of these hunting districts barely overlap with the HNF. Discounting those HDs, the total number of elk that have been observed on and around the Forest is 11,649 – although this is probably an underestimate because elk that occur in the ‘discounted’ HDs do spend some time on the Forest. Nevertheless, this is well in excess of that estimated at the time the Forest Plan was crafted and also in excess of that predicted for decade 5. While some of the elk in these hunting districts spend all or part of their time on non-Helena National Forest land, a considerable number of them—well in excess of 6,400—are part of the Helena NF population.

Further, this exemption should not preclude the Forest’s ability to achieve the goals and objectives as outlined in the Forest Plan. The goal, to “maintain and improve the habitat over time to support big game and other wildlife species” (USDA 1986, p. II/1) is being achieved through the retention of hiding cover elsewhere throughout the project area. Our objective, - “management will emphasize…the maintenance or enhancement of elk habitat...” (USDA 1986, p. II/4) – is also being realized for the same reasons.

In summary, while this project may affect elk to some extent by removing hiding and thermal cover, the Forest would retain habitat components necessary to support the elk potential directed by the Forest Plan as evidenced by the current elk numbers Forestwide. We would also continue to achieve our objective of “ensuring that viable populations of existing…animal species are maintained” (USDA 1986, p. II/17).

Cumulative Effects of Other Forest Plan Amendments

Cumulative effects are the impacts on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, Federal or non-Federal. The cumulative effects analysis considers spatial and temporal boundaries, how past activities have contributed to the existing condition, and whether the ecosystem can accommodate additional effects.

This section addresses cumulative effects in two ways: those associated with site-specific project amendments and those associated with programmatic amendments. The effects of site-specific project amendments are limited in time and space; programmatic amendments provide direction that would be applied to future management activities (i.e. activities that take place after a programmatic decision).

The scale of analysis – or the cumulative effects affected environment – is the entire Forest.

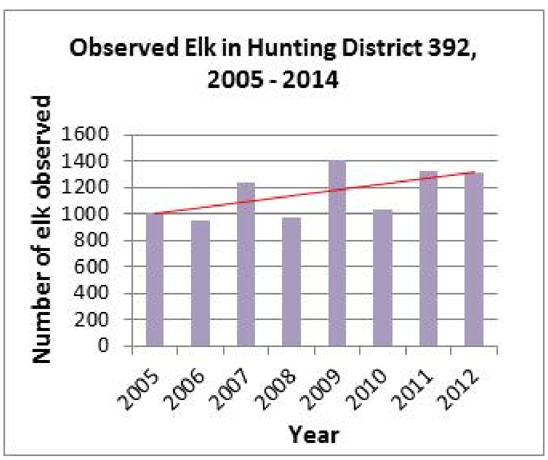


Figure 101. Observed elk in HD 392, 2005-2014.

The red line indicates trend.

Site-Specific Amendments

Existing Amendments

There are currently 29 Forest Plan amendments of which six have had implications on Big Game standards.

Amendment #7 – Miller Mountain Hard Rock Mineral Exploration Project - this site-specific amendment exempts the Miller Mountain hard rock mineral exploration project (1993) from Forest Plan Big Game Standards 3 and 4(a). Approximately 590 acres were exempted from these standards associated with the construction of new roads and drill sites.

Most likely, these roads do not provide hiding cover; however, they remain closed to all use. There were additional closures in Jimmy's Gulch, an area adjacent to this 1993 project. The corporation that originally conducted mineral explorations in the area is no longer active. This project is located in MFWP HD 392. Elk trends have been increasing in HD 392 since 2005; percent of bulls per total observed has also been increasing since 2007 (Figures 101 and 102). The decision to exempt this project from compliance with Standards 3 and 4a and the subsequent removal of 590 acres of cover does not appear to have negatively impacted elk numbers in this HD. Management challenges identified for this HD include public access and noxious weeds and not necessarily loss of cover (MFWP 2005, p. 249

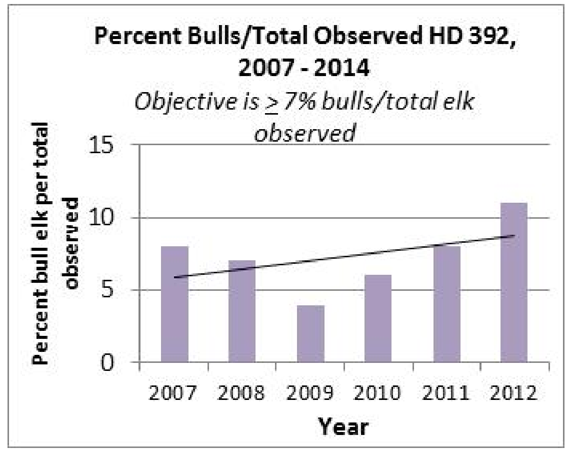


Figure 102. Percent bulls per total elk observed in HD 392, 2005-2014. *The black line indicates trend.*

Amendment #21 – Jimtown Project - this site-specific amendment exempted the Jimtown Project (2001) from Big Game Standard 4(a). The wildlife analysis concluded that the existing condition was not consistent with this standard. Effects associated with this project included the removal of approximately 3 percent of the hiding cover in the Hedges Mountain herd unit.

This project is also located in MFWP HD 392. The decision to exempt this project from Standard 4a and the subsequent removal of hiding cover does not appear to have negatively impacted elk numbers in this HD. This may be due to the fact that management challenges in this HD are not necessarily related to loss of cover but rather to limited public access and noxious weeds

Amendment #23 – Cave Gulch Post-Fire Salvage Project - this site-specific amendment exempted the Cave Gulch Post-Fire Salvage Project from Big Game Standard 4(a). The wildlife analysis for this project indicated that the existing condition was not consistent with Standard 4(a). This was due in part to the loss of existing hiding cover from the Cave Gulch wildfire. Approximately 0.85 miles of temporary roads were built to implement the salvage sale and were subsequently decommissioned. This project is also located in HD 392. As with the Miller Mountain Mine Exploration Project and the Jimtown Project, the impacts to elk as a result of the removal of hiding cover below Forest Plan thresholds appear minimal.

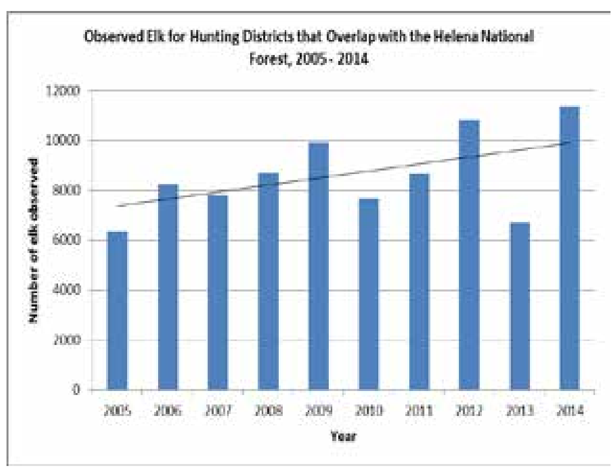


Figure 103. Observed elk in all HDs that overlap with the Forest 2005-2014. *The black line indicates trend.*

Amendment #26 – Fuels Reduction and Hazardous Tree Removal Project - this site-specific amendment exempted the Fuels Reduction and Hazardous Tree Removal Project from Forest Plan Big Game Standards 3 and 4(a). The wildlife analysis for this project concluded that the existing condition for Forest Plan Standard 3 is not met within 17 of the 27 Elk Herd Units (EHU) for hiding cover and none of the EHUs meet Forest Plan Standard 3 for thermal cover. The existing condition for Forest Plan Standard 4a is not met within 22 of the 27 EHUs. Implementation of the Decision did not result in any additional EHUs being below these Forest Plan Standards. The Decision resulted in minimal reductions of hiding cover within those EHUs where existing conditions were already below Forest Plan Standard 3; a 1 percent reduction in two EHUs, and less than a 1 percent reduction in all other EHUs. Twenty two EHUs did not currently meet Forest Plan Standard 4(a). The open road densities however were not a part of this decision.

This project occurs within several HDs given that its scope is Forestwide. The trend in elk numbers continues to increase despite the fact that this decision resulted in several herd units dropping further below thresholds specified in Forest Plan standards (figure 103). Management challenges in these HDs include limited public access, development, and loss of cover and security.

Amendment #28 – Cabin Gulch Vegetation Treatment Project – this exempts the Cabin Gulch Vegetation Treatment Project from the Forest Plan standards for hiding cover on summer range and the open road density/hiding cover ratio during the hunting season (Big Game Standards 3 and 4(a) respectively, USDA 1986, p. II/17). Overall, this project would affect elk habitat to a limited extent by removing cover within the affected EHUs.

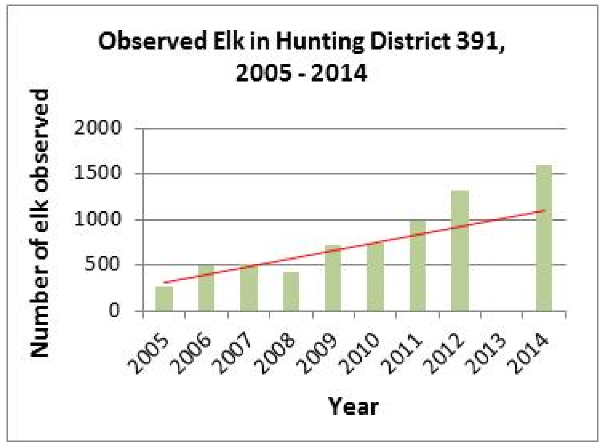


Figure 104. Observed elk in HD 391 2005-2014.*The red line indicates trend.*

Regardless of project implementation, this loss would occur naturally over the next few years due to extensive tree mortality and natural tree fall from the insect infestation. In addition, the selected treatments may be beneficial for elk over the current situation, as they could quicken the regeneration rate of new forests. The analysis concluded that through the life of the project and with the subsequent recovery of hiding cover over time, elk habitat would remain abundant and well distributed across the Forest. Approximately 2,313 acres of hiding cover will be removed in the Cabin Creek Herd Unit which is a reduction of 6 percent from the existing condition.

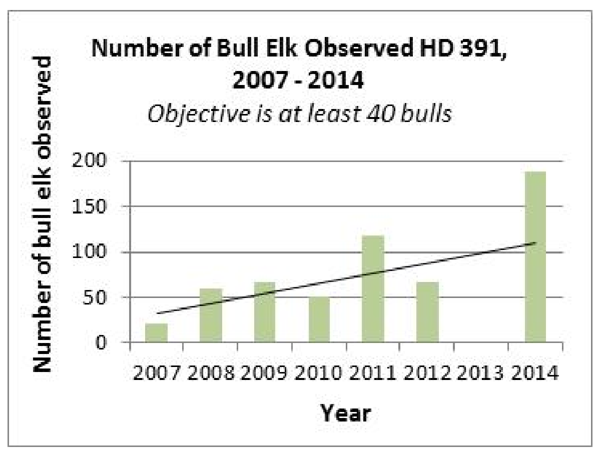


Figure 105. Number of bull elk observed in HD 391 2005-2014. *The black line indicates trend.*

Approximately 190 acres of hiding cover will be removed in the North Fork Herd Unit which is less than a 1 percent reduction from the existing condition.

The Cabin Gulch Project Decision does not result in any increases in open road density during the hunting season. However, due to the removal of hiding cover within the Cabin Creek and North Fork EHUs and because both EHUs are below Forest Plan Standard 4(a) in the existing condition, the Project Decision does not meet Standard 4(a) thresholds. Mitigation measures have been included from the Montana Cooperative Elk-Logging Study that would minimize project-related disturbances.

This project is located in HD 391. It is currently in the implementation phase. Elk numbers and the number of bull elk observed have been increasing since 2005 and 2007 respectively (figure 104 and figure 105). The management challenges in this HD include limited public access and noxious weeds; not necessarily reductions in cover (MFWP 2005, pp. 255-257).

Amendment #29 – Red Mountain Flume/Chessman Reservoir Project - this exempts the Red Mountain Flume/Chessman Reservoir Project from Forest Plan Standard 3 for hiding cover on summer range (Forest Plan p. II/17) for the Quartz Creek herd unit and from Forest Plan Standard 4(a) (Forest Plan p. II/17-18) for both the Black Mountain-Brooklyn Bridge and Quartz Creek herd units. The decision to exempt this project from Standard 3 for the Quartz Creek EHU and 4(a) for both Black Mountain-Brooklyn Bridge and Quart Creek EHU may affect elk to some extent due to the removal of hiding cover from these EHUs.

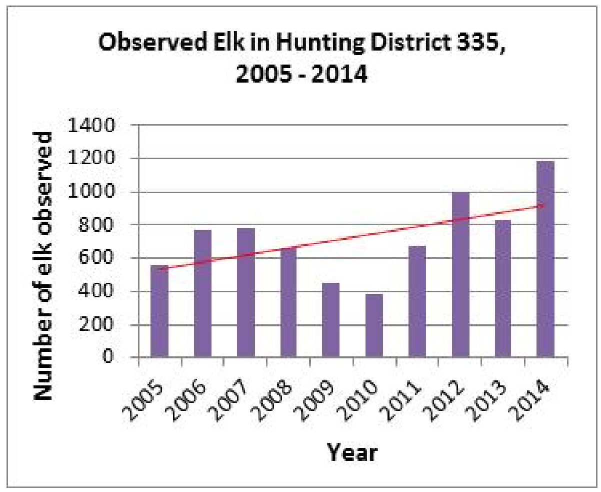


Figure 106. Observed elk in hunting district 335 2005-2014. ***The red line indicates trend.***

The project would treat approximately 490 acres, removing all dead trees and woody debris from an approximate 450-foot-wide corridor, along the Red Mountain Flume and removing mostly dead trees and woody debris from a broad swath around Chessman Reservoir and its meadows. All hiding cover within the units, currently 434 acres (includes 4 acres from Jericho Mountain EHU), would be lost. Approximately 0.5 mile of low-grade road would be constructed east of Chessman Reservoir: It would not be open to public vehicle use and it would be obliterated after the project.

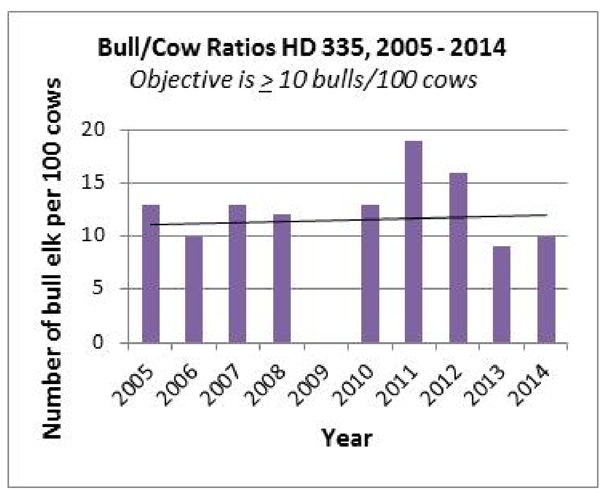


Figure 107. Bull/cow ratios in hunting district 335 2005-2014. ***The black line indicates trend.***

Regardless of project implementation, this loss would occur naturally over the next few years due to extensive tree mortality and natural tree fall associated with the mountain pine beetle infestation (Mitchell and Preisler 1998, Lewis and Hartley 2005, among others).

The Red Mountain Flume/Chessman Reservoir Project does not result in any increases in open road density during the hunting season. However, due to the removal of hiding cover within the Black Mountain – Brooklyn Bridge and Quartz Creek EHUs and because both EHUs are below Forest Plan Standard 4(a) in the existing condition, the Project Decision does not meet Standard 4(a) thresholds. Mitigation measures have been included from the Montana Cooperative Elk-Logging Study that would minimize project-related disturbances.

This project occurs within HD 335. It is currently being implemented. Elk numbers have been increasing since 2005 while the bull/cow ratio has remained relatively static (Figure 106 and Figure 107). Management challenges in this HD include housing development and mining activity, extensive motorized use, and wolf establishment (MFWP 2005, pp. 190-193).

Proposed Amendments

Telegraph Vegetation Project

The Telegraph Vegetation Project area is approximately 23,669 acres in size and is located roughly 15 miles southwest of Helena, and 5 miles south from Elliston, Montana, in the Little Blackfoot drainage west of the Continental Divide. The purpose of the project is to be responsive to the mountain pine beetle outbreak in this area, recover economic value of dead and dying trees, promote desirable regeneration, reduce fuels and the risk of wildfire, and maintain diverse wildlife habitats.

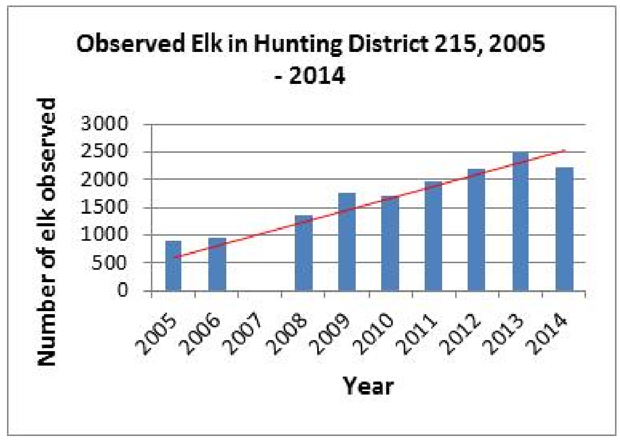


Figure 108. Observed elk in HD 215 2005-2014. ***The red line indicates trend.***

To meet the purpose and need, a site-specific amendment exempting the project from Forest Plan Standard Big Game Standards 3 and 4(a) may be required. This project is currently in the analysis phase. This project occurs within HD 215. It is currently being implemented. Elk numbers have been increasing since 2005 while the bull/cow ratio has been declining (figure 108 and figure 109). Management challenges in this HD include housing development and mining activity, access, extensive motorized use, and wolf establishment (MFWP 2005, pp. 190-193).

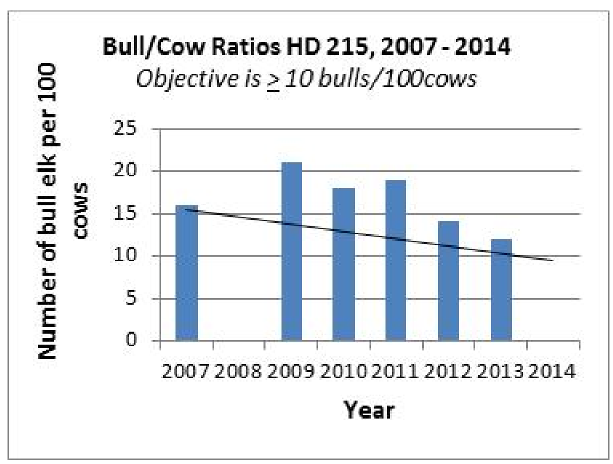


Figure 109. Bull/cow ratios in HD 215 2005-2014. ***The red line indicates trend.***

Tenmile South Helena Project

The Tenmile – South Helena Project encompasses approximately 49,500 acres of National Forest System land west and south of Helena, Montana. The project area is located within the Upper Tenmile watershed, the primary source of municipal water for the City of Helena, and extends east through Colorado Gulch and the South Hills area of Helena, Montana. The purpose of the project is to maintain consistent quantity and quality of water within the municipal watershed and improve conditions for public and firefighter safety across the landscape in the event of a wildfire. In order to achieve this purpose, there is a need to create a mosaic of vegetation and fuel structure more resilient to disturbance which would provide for safer, more effective fire suppression actions. Site-specific amendments to the Helena National Forest (HNF) Plan may be necessary to meet the project's purpose and need. Possible amendments may be needed for Forest Plan Standards 3, 4a and 6 as well as for those management area standards listed in below.

H1

Maintain adequate elk thermal and hiding cover adjacent to forage areas as determined by a wildlife biologist. Generally, this means providing at least 25 percent thermal cover on identified winter range.

H2

Maintain adequate elk thermal and hiding cover adjacent to forage areas as determined by a wildlife biologist. Generally, this means providing at least 25 percent thermal cover on identified winter range.

L2

Maintain adequate elk thermal and hiding cover adjacent to forage areas as determined by a wildlife biologist. Generally, this means providing at least 25 percent thermal cover on identified winter range.

T3

Maintain a minimum of 35 percent hiding cover for big game. Maintain thermal cover adjacent to forage areas.

T5

Maintain adequate thermal and hiding cover adjacent to forage areas provided timber harvest volumes are no significantly reduced over the rotation period.

Specific design criteria and mitigations would be included in order to minimize effects to elk during project implementation. These include: restricting public use of temporary roads, prohibiting logging operations during the first two weeks of the general rifle season to maintain elk habitat capability, and confining logging to a single drainage at a time with all work completed in the shortest time frame possible.

This project occurs within HD 335. Elk numbers have been increasing since 2005 while the bull/cow ratio has remained relatively static. Management challenges in this HD include housing development and mining activity, extensive motorized use, and wolf establishment (MFWP 2005, pp. 190-193). See figure 106 and figure 107.

Site-Specific Amendment Analysis

MFWP elk population management focuses on maintaining numbers well above population viability thresholds, protecting certain sex and age classes from over-harvest, providing public hunting opportunity, and attempting to balance elk distribution across public and private lands. The Forest Service strives to complement MFWP's efforts through management of elk habitat on National Forest

System lands. However, within the multiple use mandate of the Forest Service, management for elk is only one of many considerations on National Forest System lands. Other multiple use considerations may be favored over elk in order to achieve management area goals of the Forest Plan. If these consideratons conflict with a Forest Plan standard, the Forest Supervisor may approve an exception to that standard (USDA 1986, p. II/14). Such has been the case with the site-specific amendments described here. However, despite these amendments and their associated impacts to cover (thermal and hiding), bull survival as measured by MFWP, is at objectives across a majority of the Forest (figure 110). This is not to suggest that cover does not play a role in elk population dynamics. Rather, it indicates that cover alone may not be a predicator of elk numbers (Lyon and Canfield 1991; Unsworth and Kuck 1991; Lyon and Christensen 1992; Christensen et al. 1993, Stubblefield et al. 2006 p. 1068, Montgomery et al. 2013, p. 322, Proffitt et al. 2013).

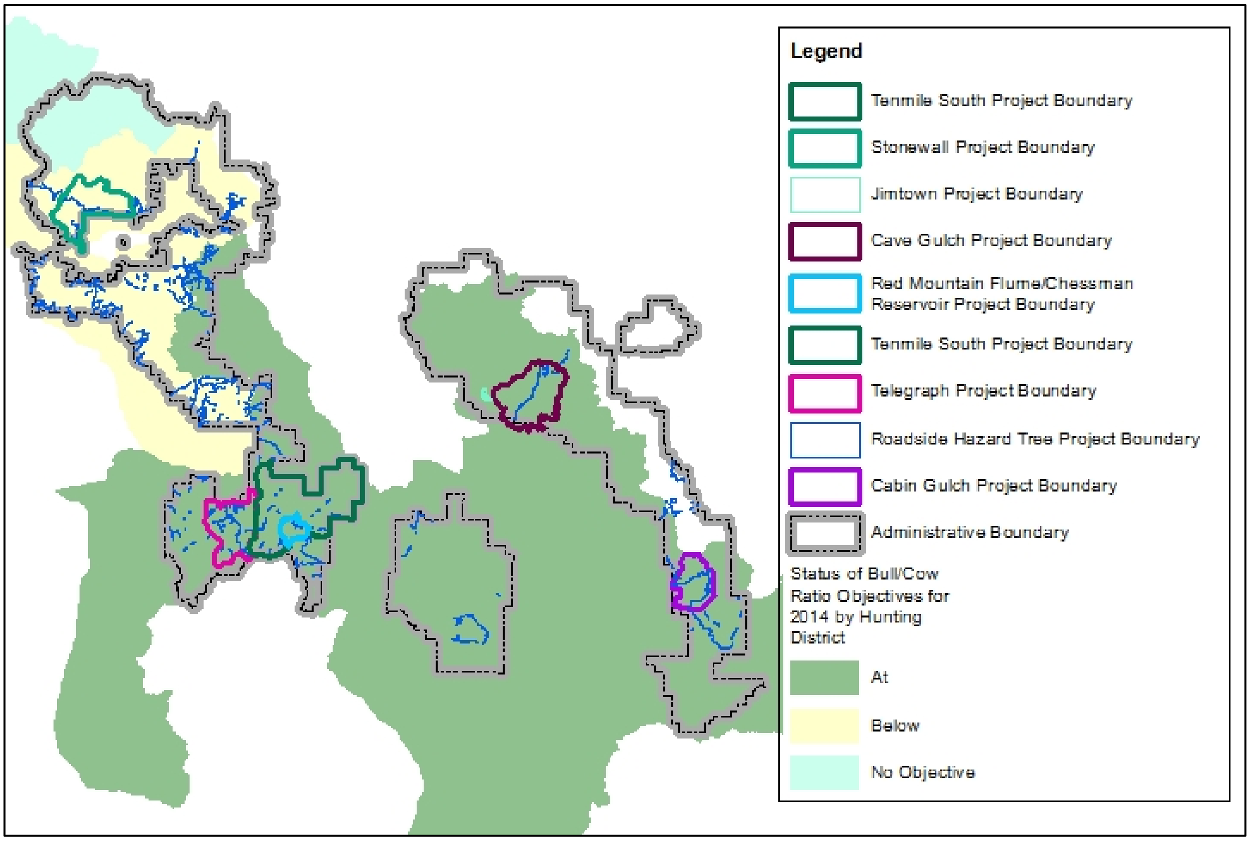


Figure 110. MFWP bull survival objectives and projects for which a site-specific amendment has been completed or is proposed

Total numbers of hunters, elk harvested, and bull elk harvested has remained relatively stable in those HDs that overlap with the HNF suggesting that the reductions in cover associated with these site-specific amendments may be so minor as to not influence hunter numbers and harvest success (figure 111).

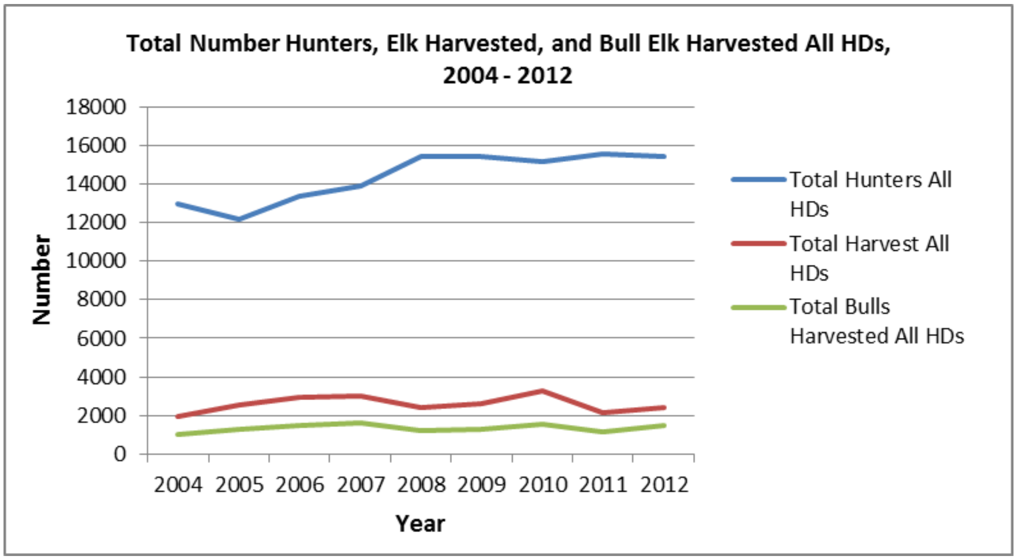


Figure 111. Total number hunters, elk harvested, and bull elk harvested in those HDs that overlap the Forest, 2004 – 2012

A variety of factors influence elk distribution and abundance in addition to cover management. The lack of public access to hunt big game on private lands and the resulting differences in relative hunting pressure can play a major role in elk population dynamics and distribution. Human disturbance and potential for displacement of big game animals is not restricted to the 5- week rifle season currently in place in Montana. Because archery hunting has increased significantly in popularity, there has been a noted shift in some cases of elk moving to private land, as a result of displacement during the archery season. Human disturbance may also influence elk habitat use and distribution during time periods outside of the hunting season. In addition, predators (generally mountain lions, wolves, and bears) also influence elk population dynamics and distribution in some areas.

Elk are fairly resilient animals. Ernest Thompson Seton (as cited in RMEF 1997) postulated that 10 million elk lived in North America prior to European settlement. By 1907, there were less than 100,000. In Montana, elk were widely distributed during the era of exploration. As Montana was 'settled', elk began to decline were completely eliminated from eastern Montana by the early 1900s. Today, elk are abundant; their ability to withstand near extirpation at the turn of the last century strongly suggests that they can withstand temporary declines in available cover associated with the site-specific amendments described herein

Programmatic Amendments

Existing Amendments

Northern Rockies Lynx Management Direction (NRLMD)

The NRLMD was amended to National Forest Plans in Montana and parts of Idaho, Wyoming, and Utah in 2007. The NRLMD incorporates management direction that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System lands, while preserving the overall multiple use direction in existing plans. Some of the NRLMD standards may benefit elk and other big game by retaining winter snowshoe hare habitat which may provide cover, reducing disturbance associated with mineral development, and reducing habitat fragmentation (USDA 2007, p. 210)

Proposed Amendments

Divide Travel Plan

The Divide Travel Plan Programmatic Amendment draft decision has recently been released. The proposed programmatic amendment is as follows:

Standard

Road management will be implemented to maintain or improve big game security and hunting opportunity.

Road management will also be implemented to maintain or improve big game intermittent refuge areas.

This standard applies only to the National Forest System lands within those portions of the following elk herd units that are within the Helena Ranger District, Helena National Forest administrative boundary – Black Mountain-Brooklyn Bridge, Greenhorn, Jericho, Little Prickly Pear-Ophir, Quartz Creek, and Spotted Dog-Little Blackfoot.

Public Motorized Use: Public motorized use will be managed during the hunting season (from 9/1 – 12/1) to maintain elk security and intermittent refuge areas at the following levels:

Percentage of Elk Security and Intermittent Refuge Areas within that Portion of an Elk Herd Unit within the Helena Ranger District Administrative Boundary		
Herd Unit	**Security %**	**Intermittent Refuge Area %**
Black Mountain–Brooklyn Bridge	16	5
Greenhorn	30	1
Jericho	17	0
Spotted Dog - Little Blackfoot	38	4
Little Prickly Pear—Ophir	28	1
Quartz	0	6

> **Other Use:** Administrative use for travel on routes that are closed to public motorized use is permitted subject to existing authorization procedures (i.e. variances approved by line officers are required prior to use of motorized routes closed to the public).

Temporary reductions associated with management activities in security blocks and intermittent refuge areas between 9/1 and 12/1 are allowed as long as impacts to elk or elk security are mitigated at the project level. Temporary reductions will be evaluated and effects analyzed (including cumulative effects) at the project level and reviewed by a wildlife biologist. It is at this scale and time when project design features and/or mitigations would be applied to ensure that impacts to elk or elk security during hunting season are addressed and reduced during implementation of the project. Temporary reductions are managed at the project scale and at the herd unit (or across herd units where security blocks cross into one or more herd units) to ensure big game security during the 9/1 – 12/1 hunting season is maintained or improved over the long term.

Permanent changes (e.g. reduction in overall secure acres) are allowed in elk security areas as long as the overall percent of elk security in a herd unit does not decrease and a site-specific analysis indicates that elk are unlikely to be negatively impacted by that change.

Permanent changes are allowed in intermittent refuge areas as long as the overall percent of intermittent areas in a herd unit does not decrease and a site-specific analysis indicates that elk are unlikely to be negatively impacted by that change OR if the decrease is due to those acres becoming part of a security area.

Exceptions to the Standard

Emergency situations are not subject to this standard.

Standard Definitions

Security is defined as a proportion of an elk herd unit within the administrative boundary of the Helena Ranger District that consists of an area of at least 1000 acres in size that is at least ½ mile from a motorized route open to the public between 9/1 and 12/1. Security blocks are adjusted for constrictions less than or equal to ½ mile in width. Security is calculated across all ownerships within the administrative boundary.

Intermittent Refuge Areas are defined as those areas at least 250 acres in size and less than 1000 acres in size that are greater than or equal to ½ mile from a motorized route open to the public between 9/1 and 12/1. Intermittent Refuge Areas are adjusted for constrictions less than or equal to ½ mile in width. Intermittent Refuge Areas are calculated across all ownerships within the administrative boundary.

Administrative use for travel on motorized routes is defined as vehicle use associated with management activities or projects on National Forest land administered by the Forest Service or under authorization of the Forest Service. Management Activities include but are not limited to, law enforcement, timber harvest, reforestation, cultural treatments, prescribed fire, watershed restoration, wildlife and fish habitat improvement, private land access, allotment management activities, and mineral exploration and development that occur on National Forest land administered by the Forest Service or under authorization of the Forest Service.

Mitigation is defined as design elements and/or constraints applied to project level activities that reduce project impacts on elk or elk security. Mitigation measures may include but are not limited to one or more of the following: timing restrictions of activities in security blocks, confining activities to one security block at a time, completing as much of the preparatory work as possible prior to the hunting season, reducing the size/acres/intensity/magnitude of the activity, allowing activities that benefit elk (particularly in management areas with a wildlife emphasis), limiting activities to one season, temporarily closing roads open to the public to compensate for the activity, etc.

Alternative B also includes cover guidelines as follows:

Guidelines

12. Cover should be distributed in a manner that mimics or approximates a natural range of variation (NRV). NRV is generally defined as the spatial and temporal variation in ecosystem characteristics under historic disturbance regimes during a reference period. A reference period should be sufficiently long to include the full range of variation produced by dominant natural disturbance regimes. Fire, wind, and insect/disease outbreaks are examples of disturbances.
13. Subject to Guideline #1, provide cover, if available, between elk security areas to maintain habitat connectivity and facilitate seasonal movement. Saddles, low divides, and heads of drainages are examples of important landscape features within which cover should be retained when possible in order to provide habitat connectivity.

14. Subject to Guideline #1, vegetation management projects should be planned to recruit or improve cover, where such habitat is limited or not available.
15. Subject to Guideline #1, provide cover, if available, in elk security areas to maintain and/or improve elk security in areas known to be used by elk or that have the potential to be used by elk. The upper third of the slope in moderate to large drainages and lower third of slope in drainage heads are examples of areas that have the potential to be used by elk.
16. Frequent, continuous dense cover, if available, should be provided adjacent to system roads within and between elk security areas to maintain habitat connectivity and elk security. 'Dense' cover may include trees, shrubs, and/or topography among other factors and is site-specific in nature; as such it is purposefully not defined here.
17. Design management activities to avoid reducing hiding cover where recruitment of hiding cover is an objective.

Guidelines Definitions

Cover is defined as vegetation that provides elk with a means of escape from the threat of predation or harassment and reduces the chance of detection. Here, the definition of cover may include hiding cover, screening cover, or concealment cover. Hiding cover is defined in the Helena National Forest Plan as either (1) vegetation capable of hiding 90 percent of an elk at 200 feet or (2) a standoff coniferous trees having a crown closure of greater than 40 percent or concealment cover which consists of vegetation dense enough to aid animals in escaping from predation or harassment. Screening cover may include conifers and other vegetation that afford longer sight distances then hiding cover but that can obstruct a clear view toward standing or moving elk. Concealment cover may include small conifers, shrubs, boulders, or dead fall that can hide calves/fawns and bedded adults and may service to impede hunter movement. Concealment cover is generally more open than hiding cover.

Habitat connectivity consists of an adequate amount of hiding or screening cover arranged in a way that allows elk to move around.

System Road is defined as a road that is part of the Forest development transportation system.

Alternative B also includes a goal as follows:

Goal

Maintain or, where opportunities arise, improve big game security in those portions of an elk herd unit within the administrative boundary of the Helena Ranger District during the 9/1 – 12/1 hunting season where security is less than 50 percent. Maintain big game security in those portions of an elk herd unit within the administrative boundary of the Helena Ranger District between 9/1 and 12/1 where security is greater than or equal to 50 percent.

Blackfoot Non-Winter Travel Plan

The proposed programmatic amendment for the Blackfoot Non-Winter Travel Plan is as follows:

- Road management will be implemented to maintain or improve big game security and hunting opportunity.
- This standard applies only to the National Forest System lands within those portions of an elk herd unit that are within the Lincoln Ranger District, Helena National Forest administrative boundary.
- *Public Motorized Use*: Public motorized use will be managed during the hunting season (from 9/1 – 12/1) to maintain elk security at the following levels:

Table 135. Elk security in herd units by Blackfoot Non-winter Travel Plan alternative

Percentage of Elk Security within that Portion of an Elk Herd Unit within the Lincoln Ranger District Administrative Boundary by Travel Plan Alternative				
Herd Unit	**Alternative 1 Security Percent**	**Alternative 2 Security Percent**	**Alternative 3 Security Percent**	**Alternative 4 Security Percent**
Arrastra	57	55	57	57
Beaver Creek	41	47	52	48
Flesher Pass	27	32	49	42
Keep Cool	36	46	60	52
Landers	84	84	84	84
Nevada	44	47	59	52
Ogden	21	23	41	24
Poorman	12	15	40	32

> ***Other Use*:** Administrative use for travel on routes that are closed to public motorized use is permitted subject to existing authorization procedures (i.e. variances approved by line officers are required prior to use of motorized routes closed to the public).

Temporary reductions associated with management activities in security blocks between 9/1 and 12/1 are allowed as long as impacts to elk or elk security are mitigated at the project level. Temporary reductions will be evaluated and effects analyzed (including cumulative effects) at the project level and reviewed by a journey level wildlife biologist. It is at this scale and time when project design features and/or mitigations would be applied to ensure that impacts to elk or elk security during hunting season are addressed and reduced over the implementation timeline of the project. Temporary reductions are managed at the project scale and at the herd unit (or across herd units where security blocks cross into one or more herd units) to ensure big game security during the 9/1 – 12/1 hunting season is maintained or improved over the long term.

Security is defined as a proportion of an elk herd unit within the administrative boundary of the Lincoln Ranger District that consists of an area of at least 1000 acres in size that is at least ½ mile from a motorized route open to the public between 9/1 and 12/1. Security blocks do not include constrictions less than or equal to ½ mile in width. Security is calculated across all ownerships within the administrative boundary.

Forest Plan Amendment to Incorporate Relevant Direction from the Northern Continental Divide Ecosystem Grizzly Bear Conservation Strategy

The purpose of the amendment is to incorporate relevant habitat-related direction from the Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy (GBCS) into the forest plans for the Helena, Kootenai, Lewis and Clark and Lolo National Forests (also referred to as “amendment forests”) to have an integrated set of plan direction (referred to as plan components from this point forward) consistent across the national forests that are a part of the NCDE.

Under the Endangered Species Act (ESA) of 1973, federal agencies are directed to use their authorities to seek to conserve endangered and threatened species. The amendment forests’ associated plans (Helena National Forest, approved by the Regional Forester in 1986), have management direction related to grizzly bear habitat, to support recovery of the threatened grizzly bear.

Since the development of this planning direction, the grizzly bear population in the NCDE has met and exceeded recovery goals. In particular, habitat conditions and management on the national forests have contributed importantly to the increased population size and improved status of the grizzly bear across the NCDE. To support a healthy, recovered grizzly population the Forest Services' continued, effective management of the NCDE grizzly bear's habitat is necessary.

In 2013, the U.S. Fish and Wildlife Service (USFWS) announced the availability of a draft GBCS for the NCDE population for public review and input. When finalized, the GBCS would become the post-delisting management plan for the NCDE grizzly bears and their habitat. By incorporating the relevant habitat-related direction from the GBCS into forest plans, the proposed amendments will demonstrate to the USFWS that adequate regulatory mechanisms exist on national forests within the NCDE to support delisting this grizzly population. Thus, the amendment forests need to amend their forest plans and incorporate the relevant desired conditions, standards, guidelines, and monitoring items related to habitat management on NFS lands in the NCDE and contained in the GBCS to show that the amendment forests have adequate regulatory mechanisms in place to support a recovered grizzly bear population.

The proposed action contains numerous standards and guidelines governing resource management on the Forest. These can be found at the following link, pages 5 – 16: (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3831237.pdf

Some of these standards and guidelines have little to no applicability to elk – i.e. food storage orders, special use permits for apiaries. The remaining standards and guidelines, if adopted, should overall benefit elk and their habitat as follows. Access and recreation standards and guidelines limit motorized access and developed recreation sites within the NCDE. There are provisions however for short term temporary increases in use associated with projects, existing mineral rights, or access to firewood. Terrestrial ecosystem guidelines provide timing considerations in the NCDE (i.e. prohibiting logging activities during the spring in key grizzly bear habitat) that would provide additional protection for elk primarily during the calving period. Grazing standards and guidelines limits grazing in the NCDE to existing allotments (except for purposes of weed control) which means that forage availability for elk should remain constant, all things being equal. Energy and mineral standards and guidelines include requirements to mitigate impacts associated with human disturbance and impacts to vegetation.

This amendment, although not specific to elk, should guide design elements for future projects that could benefit elk and their habitat by minimizing management related disturbances and maintaining or enhancing available forage.

Cumulative Effects Conclusions

All of the site-specific amendments described above have been or will be site-specific in time and space; as such, effects to elk cover are transitory. None of the past amendments has resulted in significant impacts to elk; nor should the proposed site-specific amendments significantly impact elk. Cumulatively, effects to elk hiding and thermal cover from this and other site-specific Forest Plan amendments should not compromise the Forest's ability to provide habitat potential to meet Forest Plan elk population goals. Elk will continue to be abundant across the Forest as evidenced by the increases in elk numbers since the incipience of the Forest Plan.

The past and proposed programmatic amendments (i.e. NRLMD, Blackfoot Non-winter and Divide Travel Plan Amendments, Grizzly bear amendment) should provide standards and/or guidelines that, when implemented, could result in habitat improvements for elk.

The big game standards found in the HNF Plan are based on state population goals outlined in The Northern Regional Plan (USDA 1981, pp. 4-16 and B-3). The Montana goals were derived from the 1978 Montana Statewide Comprehensive Outdoor Recreation Plan (SCORP 1978). Big game goals and objectives embodied in the Montana plan included maintaining “an available supply of big game to meet demand for all types of big game oriented recreation while insuring the protection and perpetuation of all big game species and their ecosystems” (Ibid, p. 3). Statewide goals for elk in particular included protecting and perpetuating “elk and their habitat and to increase the supply of available, harvestable elk to meet demands for hunting and non-hunting recreation” (Ibid, p. 35). The Montana Plan delineated goals and objectives by the respective ‘Fish and Game Regions’, the same regions in place today.

According to the Northern Regional Plan there were approximately 70,000 elk on the National Forests in Montana around 1981 (USDA 1981, p. 4-16 Table IV-4). State population goals projected for 1995 were intended to satisfy the growing demand for hunting and aesthetic purposes. The Northern Regional Plan identified desired population goals by State (Ibid, p. 4-17 Table IV-5) and National Forest based on those statewide goals (Ibid, p. B-3 Table B-3). The disaggregated total for the HNF was 6400 by year 2000.

The HNF is located within several hunting districts identified by MFWP. The total number of elk that have been observed in these hunting districts through the 2014 aerial surveys is 15,036 (MFWP aerial survey data). Some of these hunting districts barely overlap with the HNF. Discounting those HDs, the total number of elk that have been observed on and around the Forest is 11,649, although this is probably an underestimate because elk that occur in the ‘discounted’ HDs do spend some time on the Forest. Nevertheless, the number of elk associated with the HNF is well in excess of the 6,400 population target identified in the HNF Plan (USDA 1986, p. V/5).

Elk should continue to be abundant across the Forest as evidenced by the increases in elk numbers since the Forest Plan was adopted in 1986. Elk numbers have been increasing across the west and in Montana since the early to mid- 1900s. Statewide, post-season elk numbers increased from 8,000 in 1922 to 55,000 in 1978 to about 160,000 in 2004 (MFWP 2005 pages 4-5). Thus, there are no viability concerns for Rocky Mountain elk in Montana or on the Helena National Forest. This is supported by their global status of ‘G5’ and the statewide status of ‘S5’ which are both defined as “common, widespread, and abundant…”

This site-specific amendment should have little cumulative long-term impacts to the long-term relationship with multiple-use goods and services or have a substantive impact on the land management plan or its resources when considered with site-specific amendments 7, 21, 23, 24, 28 and 29.

NFMA Significance/Non-Significance Finding

The National Forest Management Act (NFMA) provides that forest plans may be amended in any manner, but if the management direction results in a significant change in the plan, additional procedures must be followed.

In April 2012, the Forest Service adopted new planning regulations at 36 CFR 219, Subpart A and Subpart B, which replaced the final 2000 land management planning rule (2000 rule) as reinstated in the Code of Federal Regulations on December 18, 2009 (74 FR 67062). The 2012 rule includes a transition period during which plan amendments may be initiated under the provisions of the prior planning regulation for 3 years after May 9, 2012 and may be completed and approved under those provisions. This amendment is being completed under the requirements of the 1982 regulations. It is, however, subject to the objection process in 36 CFR 219 Subpart B (at 219.59(b)).

The 1982 regulations at 219.10(f) require the agency to determine whether or not a proposed amendment would result in a significant change in the plan. If the change resulting from the proposed amendment is determined to be significant, the same procedure as that required for development and approval of a plan shall be followed. If the change resulting from the amendment is determined not to be significant for the purposes of the planning process, then the agency may implement the amendment following appropriate public notification and completion of the NEPA procedures.

Forest Service Manual section 1926.5 identifies factors to consider in determining whether an amendment is significant or non-significant for those plans using planning regulations in place before November 9, 2000.

Table 136. Factors for Consideration to Determine Amendment Significance

Changes to the Land Management Plan That are Not Significant	Management Standards 3 and 4(a) and Management Area T-2 and T-3 Exceptions
1. Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management.	This site specific amendment is consistent with the goals and objectives of the Forest Plan, including Forest-wide goals to maintain and improve the habitat over time to support big game and other wildlife species. (Forest Plan page II/1). Effects to habitat are limited and impact a small portion of the overall Forest habitat for big game.
2. Adjustments of management area boundaries of management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management.	The amendment does not adjust management area boundaries or management prescriptions.
3. Minor changes in standards and guidelines.	The amendment is a one-time, site-specific and project-specific exception for the application of Standards 3 and 4(a) in the Beaver Creek – Lincoln and Keep Cool Creek herd units and from Management Area T-2 standards for Thermal Cover and Hiding Cover in openings adjacent to harvest and Management Area T-3 standards for Hiding Cover and Hiding Cover in openings adjacent to harvest. Exempting this project from the standards is not expected to impact overall elk population levels.
4. Opportunities for additional projects or activities that will contribute to achievement of the management prescription.	This site-specific amendment is consistent with the six Management Area's (MAs) goals, standards and practices. The six MAs overlapping with the project treatment areas include M-1 (3,277 acres), T-1 (881 acres), T-2 (972 acres), T-3 (1,621 acres), T-4 (595 acres) and W-1 (1,219 acres) under alt. 2 and M-1 (2,634 acres), T-1 (747 acres), T-2 (807 acres), T-3 (634 acres), T-4 (588 acres) and W-1 (1,155 acres) under alt. 3. MAs T-2, T-3 and W-1 comprise 45% (alt. 2) or 40% (alt. 3) of the proposed treatment areas with goals to maintain or enhance big game habitat (paraphrased). Effects, as described in this amendment with further details in the Wildlife Specialist Report and Biological Evaluation, are limited in geographic scope and carry minimal impacts to elk locally and toward the overall Forest wide perspective as described above under Cumulative Effects of Other Forest Plan Amendments and reasonably foreseeable actions.

This site-specific amendment would not alter the long-term relationship between levels of multiple-use goods and services originally projected in the Forest Plan for wildlife habitat, Allowable Sale Quantity, or other resource outputs, nor does it have an important effect on the entire land management plan or affect land and resources throughout a large portion of the planning area during the planning period.

Based on consideration of the four factors identified in the Forest Service Manual, 1926.51, and considering the Forest Plan in its entirety, exempting this project from Standards 3 and 4(a) of the Helena National Forest Plan and Management Area T-2 and T-3 thermal and hiding cover standards would not be a significant change under NFMA to the Helena Forest Plan. This amendment is fully consistent with, but further refines and clarifies the means to achieve, current Forest Plan goals and objectives.

Conclusions

The reduction in canopy cover combined with site preparation would increase herbaceous and woody vegetation and elk forage for 10 to 20 years, although this will decline over time (Rapp 2006, Wisdom et al 2005, Hayden et al 2008). The availability of forage for elk would depend on its proximity to cover and generally the highest elk use would occur within approximately 300 to 500 feet of cover, with use decreasing with increasing distance from edges/cover (Thompson 1988, Wisdom et al. 2005).

Several studies have been conducted that describe an optimum cover/forage ratio. For example, Black et al. (1976, p. 12) define optimum habitat as 40 percent cover, 60 percent forage (although, the authors state that the description of optimum cover as 40 percent of an area is based on an average (Ibid p. 30). They even suggest that a reduction in cover may be appropriate to increase elk use in an area (until, of course, cover becomes limiting) particularly if forage is limiting (Ibid p. 20). The authors also predict that in some landtypes, cover can be reduced below 40 percent without a subsequent decline in elk use of that area (Ibid, pp. 20-27).

As described in the Affected Environment, forage is limiting in the project area except in the Snow Talon Fire perimeter [See Figure 76 – note the predominance of forested stands in the project area]. The forage created as a result of that fire is of limited value due to the absence of cover. Forage that would be created through the Stonewall project would be of the configuration (i.e. cover and forage intermixed) to be beneficial to elk. Design elements from the ‘Coordinating Elk and Timber Management’ report (Lyons et al. 1985 and USDA 1986, Appendix C) are in place to ensure that forage produced through timber harvest is available to elk.

Overall, this project may affect elk to some extent by removing hiding and thermal cover. Regardless of project implementation, this loss will occur naturally over the next few years due to extensive tree mortality and natural tree fall from the insect infestation. However, through the life of this project and with the subsequent recovery of hiding cover over time, elk habitat should remain abundant and well distributed across the Forest. It is anticipated that the Forest would retain habitat components necessary to maintain a viable and huntable elk population. However, while habitat (e.g. hiding cover) is important to the long term viability of elk populations, elk populations – and their viability - are more likely to be controlled by harvest than by limits in cover (Unsworth et al. 1993, Bender and Miller 1999, Biederbeck et al. 2001, Conard et al. 2012).

Furthermore, implementation of this project, and others for which Forest Plan amendments have been or could be applied, should not impede the ability of the Forest to maintain and/or improve big game security while providing for an extended hunting season – the intent of Standard 4(a). In the following table, the metrics used by MFWP to determine if elk objectives are being met indicate that for the most part the hunting districts that overlap with the Forest are at or above MFWP objectives.

Table 137. MFWP population objectives and recent trend data

Hunting District	Population Objectives Based on Aerial Surveys Post-Harvest (MFWP 2005)	Recent Trend Data (Year of Data)	Summary
215	>10 bulls/100 cows	12 bulls/100 cows (2013)	Meets objectives. Management challenges in this HD include development, access, and predation. Cover has not been identified as an issue (MFWP 2005, p. 190)
280	No specific objective; tied to 280	No specific data	Harvest objectives are based on elk numbers in adjacent hunting districts. See discussion below (HD 281) for management challenges in this HD.
281	15 bulls/100 cows or 8% bulls/total elk observed	14 bulls/100 cows (2014)	Slightly below objectives; Management challenges in this HD include access, disposition of Plum Creek Timber lands, predation, and habitat conditions related to forage availability (MFWP 2005, pp. 113-115) “Many segments of the elk populations are influenced by the successional stages of vegetation in the wilderness and by roadless habitats. Much of this area is not at a successional stage of vegetation that is conducive to producing abundant forage and dense elk populations.” Cover has not been identified as an issue.
293	10 bulls/100 cows	5 bulls/100 cows (2014)	Below objectives. Management challenges in this HD include development, access, noxious weeds, predation, and elk security in terms of cover and road densities (MFWP 2005, pp. 197-198).
335	>10 bulls/100 cows	10 bulls/100 cows (2014)	Long term average is 13 bulls/100 cows. Management challenges in this HD include development, access, and predation. Cover has not been identified as an issue. See discussion under Rationale.
339	15 bulls/100 cows	38 bulls/100 cows (2014)	Above objectives. Management challenges in this HD include development, access, noxious weeds, predation, and elk security in terms of cover and road densities (MFWP 2005, pp. 197-198).
343	10 bulls/100 cows	14 bulls/100 cows (2014)	Meets objectives. Management challenges in this HD include development, access, noxious weeds, predation, and elk security in terms of cover and road densities (MFWP 2005, pp. 197-198).
380	15 bulls/100 cows or 10% antlered bulls/total elk observed	3% antlered bulls/total elk observed (2014)	Below objectives; according to the 2013 aerial survey report some elk may have been missed during the survey. Also wolf presence may be affecting detectability. Management challenges in this HD include access and development (MFWP 2005, pp. 242-243). Cover has not been identified as an issue.

Hunting District	Population Objectives Based on Aerial Surveys Post-Harvest (MFWP 2005)	Recent Trend Data (Year of Data)	Summary
390	65 bulls	347 bulls (2014)	Above objective. Management challenges in the HD include access, noxious weeds, and a preponderance of private land (MFWP 2005, p 255).
391	40 bulls	188 bulls (2014)	Basically meets objectives. Management challenges in the HD include access, noxious weeds, and a preponderance of private land (MFWP 2005, p 255). Cover has not been identified as an issue.
392	10 bulls/100 cows or 7% bulls/total elk observed	10 bulls/100 cows (2011)	Meets objective. Management challenges identified for this HD include access and noxious weeds (MFWP 2005, p. 249).
446	67 bulls	250 bulls (2014)	Above objective. Management challenges for this HD are due to a preponderance of private land (MFWP 2005, pp. 299-300).
455	At least 60% harvest of brow-tined bulls	41% (2013)	Below objective; not enough bulls harvested relative to total harvest. Management challenges are focused on the numbers of wintering elk being below objectives due to heavy snowpack, heavy hunting pressure, and/or heavy harvest (MFWP 2005, pp. 321-322). Cover has not been identified as an issue.

There are 13 hunting districts that overlap with the Helena National Forest to the extent that management activities on the Forest could influence elk. There are a few other hunting districts that spill onto the Forest the extent of which is so minor as to render Forest management activities inconsequential. Seven of the hunting districts are at or above population objectives. One HD does not have objectives per se (HD 280); for the remaining HDs below objectives, cover has not been identified as a management challenge. This is not to suggest that the removal of hiding cover would not impact elk security but rather elk security has not been identified as a limiting factor in these HDs. As such, the amendment for Stonewall Vegetation project and those amendments described in the Cumulative Effects section should not compromise the ability of MFWP to realize population objectives or the Helena National Forest to provide big game security while providing for an extended hunting season. Several Forestwide standards remain in place that would provide protection for elk habitat in the project area (table 138). There are also Management Area-specific standards that provide additional wildlife considerations. Of the six MAs that occur in the project area (M-1, T-1, T-2, T-3, T-4, W-1), three contain standards applicable to wildlife. These are also described in table 138.

Table 138. Forestwide and management area-specific standards relevant to elk

Forest Plan Reference	Standard
Forest-wide p. II/18	Elk calving grounds and nursery areas will be closed to motorized vehicles during peak use by elk. Calving is usually in late May through mid-June and nursery areas are used in late June through July.
Forest-wide p. II/18	All winter range areas will be closed to vehicles between December 1 and May 15. Exceptions (i.e., access through the winter range to facilitate land management or public use activities on other lands) may be granted.
Forest-wide p. II/19	Montana Cooperative Elk-Logging Study Recommendations, in Appendix C, will be followed during timber sale and road construction projects.
Appendix C, Recommendations from the Final Report of the Montana Cooperative Elk-Logging Study, 1970-1985 for Coordinating Elk and Timber Management (applicable sections), pp. C/1-11	Logging activity will be confined to a single drainage at a time with all work completed in the shortest time frame possible. Prior to logging, the project wildlife biologist will work with the pre-sale forester to compartmentalize drainages in order to meet this mitigation measure. Logging operations will be prohibited during the first two weeks of the general rifle season in order to maintain big game habitat capability and hunting opportunity. All temporary roads will be closed to the public. Recreational use of firearms will be prohibited for anyone working within an area closed to the general public. Slash clean-up inside clearcuts will be reduced below 1.5 feet. Openings would be limited to 100 acres in size so as to provide efficient foraging areas for elk and deer with hiding and screening cover available in the surrounding forest.
T-2, p. III/35	Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat.
T-2, p. III/35	Schedule sale activities outside winter periods (December 1 to May 15).
T-2, p. III/35	No more than 25 percent of the timber-perimeter around natural or artificial parks should be non-thermal cover at one time.
T-3, p. III/39	Maintain thermal cover adjacent to forage areas. Appendix C provides guidance for thermal cover.
W-1, p. III/50	Wildlife habitat improvement practices, including road management, prescribed fire, and other techniques, will be used to maintain and/or enhance the quality of big game and nongame habitat.
W-1, p. III/50	Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing at least 25 percent cover, where available, on identified winter range.

Lastly, the wildlife specialist report includes an analysis of elk security areas based on Hillis et al. (1991) as refined for local conditions. The report concludes that elk security would not be altered from the current condition post-implementation. Habitat Effectiveness, as described by Lyon (1979) and Christensen et al. (1993) would not be altered from the current condition post-implementation.

Migratory Birds

As described under methodology, effects to migratory birds are addressed in the species and habitat sections of this analysis, in combination with analysis of threatened, endangered, sensitive birds and bird species of conservation concern. The memorandum of understanding (MOU) with the USDI Fish and Wildlife Service on the Migratory Bird Treaty Act identifies key principles and directs the Forest Service to (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Migratory birds and their habitats including species with viability concern (TES) and priority species are evaluated in the habitat and species-specific sections. Alternative 1 would maintain habitat over the short term, whereas alternatives 2 and 3 would help to restore declining habitats while maintaining diverse habitat conditions across the landscape. As a result, habitat for migratory birds would be maintained or improved under all alternatives. Also, local populations of all species that currently utilize the project area are expected to be maintained. The action alternatives focus on habitat restoration, and include project design features that are expected to reduce impacts to migratory birds, therefore, all alternatives are in compliance with the Migratory Bird Treaty Act.

Plants

Introduction

There are no threatened, endangered or proposed plant species known to occur on the Helena National Forest (USDI Fish and Wildlife Service 2011b). Therefore, this section is limited to analyzing Region 1(R1) sensitive species and their habitats.

Sensitive species are species identified by the Regional Forester for which population viability is currently of concern, as evidenced by significant current or predicted downward trends in population numbers or density, or by significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (USDA Forest Service 2005). The Forest Service has established direction in Forest Service Manual 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management (FSM 2600, USDA Forest Service 2005)) to guide habitat management for proposed, endangered, threatened, and sensitive plant species. This direction establishes the process, objectives, and standards for conducting a biological evaluation, and ensures that these species receive full consideration in the decision making process. The Botany Report and Biological Evaluation (Englebert 2015b) incorporated all the information required for a biological evaluation.

Nine sensitive plant species are known to occur on or very near the Helena National Forest. An additional 12 species are suspected to occur on the Forest. Those 21 species are identified in table 139, along with the likelihood of occurrence. Whitebark pine (*Pinus albicaulis*) is the only sensitive species found in the project area. The species listed as 'possible' in the project area may have habitat within the project area. Only those listed as 'known to occur' or 'possible occurrence' are carried forward in this analysis. The remaining species do not have habitat in the project area and therefore no impacts to those species from this project are expected.

Table 139. Region 1 sensitive plant species that occur or may occur on the Helena National Forest

Species **(Family) Common Name**	**Known To Occur On Helena National Forest**	**Known To Occur In Stonewall Project Area**	**Likelihood Of Occurrence In Stonewall Project Area**
Amerorchis rotundifolia (Orchidaceae) Roundleaf orchid	No	No	**Possible** – Known from the Rocky Mtn. Front and the NW corner of Montana in spruce forests along seeps and streams

Species **(Family)** **Common Name**	**Known To Occur On Helena National Forest**	**Known To Occur In Stonewall Project Area**	**Likelihood Of Occurrence In Stonewall Project Area**
Aquilegia brevistyla (Ranunculaceae) Smallflower columbine	No	No	Unlikely – In Montana, it is known only from the Little Belt Mts in open woods and stream banks at mid-elevations in the montane zone.
Astragalus lackschewitzii (Fabaceae) Lackschewitz's milkvetch	No	No	Unlikely – Restricted to high elevation gravelly and rocky slopes and ridges, this species' habitat is not generally subject to human disturbance
Botrychium crenulatum (Ophioglossaceae) Scalloped moonwort	No	No	**Possible** – Known from the Beaverhead-Deerlodge National Forest and in western Montana, it generally occurs in wet habitats with high cover.
Botrychium paradoxum (Ophioglossaceae) Peculiar moonwort	Yes	No	**Possible** – This diminutive species is known from the Occidental Plateau, and near Irish Mine Hill. On the Helena NF populations are in sagebrush/rough fescue and rough fescue, however other populations have been documented from mesic meadows associated with spruce and lodgepole pine forests in montane and subalpine (MNHP 2007)
Cypripedium parviflorum (Orchidaceae) Lesser yellow lady's slipper	Yes	No	**Possible** -- Known from Divide landscape in fens, damp mossy woods, seepage area, and moist forest-meadow ecotone, in valleys & lower montane.
Cypripedium passerinum (Orchidaceae) Sparrow egg lady's slipper	No	No	**Possible** – This orchid is found in mossy, moist, or seepy places in coniferous forest; in northwestern Montana including Glacier NP.
Drosera anglica (Droseraceae) English sundew	Yes	No	Unlikely – Known from Indian Meadows, this species occurs with sphagnum moss in wet, organic soils of fens. Habitat is specialized.
Drosera linearis (Droseraceae) Slenderleaf sundew	Yes	No	Unlikely – Known from Indian Meadows, in wet, organic soil of nutrient-poor fens
Epipactis gigantea (Orchidaceae) Stream orchid	No	No	Unlikely – This species is associated with seeps and springs, often thermal.
Goodyera repens (Orchidaceae)	No	No	Unlikely –In Montana, it is known from the Little Belt and Big

Species **(Family)** **Common Name**	**Known To Occur On Helena National Forest**	**Known To Occur In Stonewall Project Area**	**Likelihood Of Occurrence In Stonewall Project Area**
Lesser rattlesnake plantain			Snowy Mts. in moist, montane forests with mossy understory.
Grindelia howellii (Asteraceae) Howell's gumweed	No	No	**Possible** –This species is an endemic known only from a cluster of sites northeast of Missoula, and a single county in Idaho.
Juncus hallii (Juncaceae) Hall's rush	Yes	No	**Possible**—Several populations occur on the Forest in the Big Belts and the Divide area. Moist to wet meadows,
Oxytropis podocarpa (Fabaceae) Stalkpod locoweed	No	No	Unlikely – Habitat for this species is in the alpine zone.
Phlox kelseyi var. *missoulensis (Phlox missoulensis)* (Polemoniaceae) Missoula phlox	Yes	No	**Possible** – It is known from east of the analysis area; habitat is rough fescue meadow, exposed, limestone-derived slopes in foothills and montane.
Pinus albicaulis (Pinaceae) Whitebark pine	Yes	Yes	**Known to occur**- This species is known to occur in almost all major mountain ranges of western and central Montana. In the project area it is known to be a component of several of the treatment units.
Polygonum douglasii ssp. *austinae* (Polygonaceae) Austin knotweed	Yes	No	Unlikely—This taxon is known from the Big Belts in open gravelly shale-derived soil of eroding slopes/banks or usually moist, barren shale slopes.
Saxifraga tempestiva (Saxifragaceae) Storm saxifrage	No	No	Unlikely – This species is a Montana endemic known only from vernally moist open sites and rock ledges at high elevations, west of Continental Divide.
Schoenoplectus subterminalis (Cyperaceae) Swaying bulrush	Yes	No	Unlikely – This species is known from Indian Meadows, and sites in the NW primarily west of Continental Divide in open water and boggy margins of ponds, lakes, and sloughs.
Thalictrum alpinum (Ranunculaceae) Alpine meadow-rue	No	No	Unlikely – In Montana, this species is known from sites in the SW corner, in moist alkaline meadows.
Veratrum californicum (Liliaceae) California false hellebore	No	No	Unlikely – In Montana it is known from 4 sites in Bitterroot Valley

Methodology

The Montana Natural Heritage Program (MTNHP) (2010) maintains a statewide database for sensitive species. Data from the MTNHP was applied to known sensitive plant populations in the project area.

Ground reconnaissance was conducted by Forest Service personnel in representative habitats within the project area. Field reconnaissance was conducted throughout the project area, with focus on moist and wetland habitats associated with timber harvest proposals. Those habitats support several sensitive species (USDA Forest Service 1998) and have the highest potential for sensitive plant populations. Wetlands throughout the project area were delineated and no sensitive plant populations were found. Field notes and GPS locations to represent specific field locations can be found in the project record.

Past surveys by the Montana Natural Heritage Program, botanical surveys from the Indian Meadows Research Natural Area as well as past surveys by Forest Service personnel were the focus for the current survey work (Olsen 2010).

In 2005, Cooper and others conducted inventories searching for sensitive vascular plants as well as riparian and wetland associated plant communities in the area of the Snow Talon fire and areas to the west of the fire, which included the Stonewall Project area. No sensitive plant populations were found in this survey. Those survey records can be found in the project record. Barton and Crispin (2002) completed surveys across the Helena National Forest in 2002. The purpose of the surveys was to locate sensitive plant populations in association with noxious weed populations, primarily along roadsides. Some of the roads in the project area were surveyed. No sensitive plant populations were found in this area during those surveys.

Whitebark pine was added to the Regional Forester’s Sensitive Species List in 2011(Weldon 2011a), so was not included as a sensitive species in the previous surveys. Stand exam data for the project area indicate that it is present in several of the prescribed fire treatment units and it is also present in other units as an “occasional” component (Amell and Klug 2015, Milburn et al. 2009).

The methodology used in this analysis includes the best available science gathered from inventory data as well as several geospatial layers using known sensitive plant populations to predict sensitive plant habitat. The specific layers used include the Montana Natural Heritage Program data on sensitive species, the Helena National Forest Soil Survey, digital elevation models, information and experiences from past surveys, personal ground reconnaissance of the project area by Forest Service personnel along with field crew surveys in areas identified as potential habitat.

Assumptions

The following assumptions were used:

- Species on the Regional Forester's Sensitive Species List that occur on, or are suspected to occur on the Helena National Forest have been identified.
- Geospatial systems combined with habitat information, on-the-ground experience and past surveys is useful to screen areas of low probability of species occurrence.
- Reconnaissance of representative habitats is appropriate to determine the presence of sensitive plant populations.
- Known habitats need to be specifically identified and surveyed in the field.

Spatial and Temporal Context for Effects Analysis

Direct effects are those that occur at the same time and place of the proposed actions. Indirect effects are those effects that may occur along roads and stands adjacent to proposed treatments. The cumulative effects analysis area for sensitive plant species is the Stonewall Project area. For the herbaceous sensitive species this analysis is bounded in time by 10 years past and 10 years into the future, which allows for an adequate length of time to record vegetative changes. The analysis for whitebark pine however requires a much greater temporal bounding; please see the Vegetation Section for details of the whitebark pine analysis.

Overview of Issues

Comments pertaining to disclosing the effects of project activities on plants were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition.

Indicators

The following indicators were used to measure the differences between alternatives:

- For whitebark pine we looked at the total acres proposed for treatment in units in which whitebark pine has been identified.
- Because sensitive species habitat can be degraded by noxious weed infestations, we looked at the estimated acres of potential noxious weed infestation due to proposed activities.
- In addition, effects that cannot be easily quantified are described qualitatively. Impacts to sensitive plant species may be direct impacts, such as trampling, defoliation, and mechanical damage; or the impacts may be more indirect such as a change in the microclimate or a change in species composition, both of which may result in a loss of habitat. In general, direct impacts are short-term impacts, occurring immediately, while indirect impacts such as changes to the habitat occur over a longer timeframe.

Affected Environment

Existing Condition

Whitebark pine is the only sensitive species known to occur in the project area, and is carried forward in this analysis. None of the eight species identified as possibly occurring in the project area were located during survey work to date. Additional rationale for carrying these species forward in this analysis includes (Olsen 2010):

- Roundleaf orchid has not been found on the Helena National Forest, but is known from the Rocky Mountain Front, north of the Blackfoot landscape area. Habitat may exist in the wetter parts of the project area.
- Scalloped moonwort is known from the Beaverhead-Deerlodge National Forest, immediately adjacent to the Helena National Forest adjacent to the Divide landscape area. This species has not been found to date on the Helena National Forest. Habitat may exist in the project area for this species along stream bottoms, around seeps, on the edges of marshes, and in wet roadside swales.

- Peculiar moonwort is known from two populations on the Helena National Forest, both in the Divide landscape area. Habitat may occur in the project area in mesic meadows.
- Lesser yellow lady's slipper was found at one location within the Helena National Forest boundary and at another location just outside the boundary. Neither population has been recently documented in additional sensitive plant surveys. The population occurs in the Divide landscape area. Habitat may occur in the project area in moist coniferous forests, seepage areas and moist ecotones between peatlands and upland forest.
- Sparrow egg lady's slipper has not been found on the Helena National Forest but is known from Glacier Park and northwest Montana. Habitat for this species is the same as that for lesser yellow lady's slipper.
- Howell's gumweed has not been found on the Helena Forest but is known from an area west of the Blackfoot landscape. It may have habitat in the project area in vernally moist, lightly disturbed soil adjacent to ponds and marshes, as well as similar human-created habitats such as roadsides.
- Hall's rush has 15 populations Forest-wide. The Montana Heritage database identifies eight populations on the Helena National Forest (three of the Heritage Program populations were again documented by Helena National Forest survey crews in 2009). Seven new populations were found by Helena National Forest survey crews in 2009. The populations occur in the Divide and Big Belts landscape areas. This plant may have habitat in the project area in wet to moist meadows.
- Missoula phlox has been found in each of the four landscape areas of the Forest. The Montana Heritage database identifies eight populations on the Helena National Forest. Three new populations were located in 2008 and three additional populations were found in 2009 while the Forest was validating a model which predicts sensitive plant habitat. Details for field survey areas and protocols are available in the project record. There may be habitat for this taxon in the project area along wind-swept ridges and forb-dominated meadows.

Species Unlikely to be Present

All species, except whitebark pine, were included during field surveys, but it was determined that 12 of those species are unlikely to occur in the project area (as indicated in table 139). Those 12 species are not carried forward in this analysis. The following is additional rationale for the elimination of those species (Olsen 2010):

- English sundew, slenderleaf sundew and swaying bulrush are known from the Indian Meadows Research Natural Area, which is in the combination boundary but would not be affected by the proposed treatments. These species are found in fens, which are very rare and specialized habitats. No other fens are known within the project area.
- Lackschewitz's milkvetch, stream orchid, stalkpod locoweed, storm saxifrage, and California false hellebore all have very specialized habitat that does not occur in the project area.
- Smallflower columbine, lesser rattlesnake plantain, and alpine meadow-rue are not likely to occur in the project area as the known populations are not from this area. These species have not been found on the Helena National Forest to date, but the species are searched for in any survey work.

Environmental Consequences

Effects Common to All Alternatives

Effects to herbaceous sensitive species from large, stand-replacing fire

If current management continues (alternative 1), a large stand-replacing fire is a potential reality (Kurtz 2009). The action alternatives cannot eliminate the potential for a large-scale fire; however, the activities proposed are designed to modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape, thereby reducing the risk to resources in the project area. Thus, while the potential for wildfires is common to all three alternatives, there is less risk of effects to herbaceous sensitive species from wildfire under both the action alternatives.

The potential exists for wildfire to have short-term detrimental effects on herbaceous sensitive plant habitats, but long-term effects are not anticipated in most cases. However, there has been a dramatic increase of severe wildfires in the ponderosa pine type in recent decades where fuels have built up due to fire suppression (Agee and Skinner 2005). In these habitats there is potential for long-term damage to sensitive plant habitats (Menges and Dolan 1998, Pendergrass et al. 1999). Plant response to fire is a result of the interaction between severity of the fire and the individual plant species' inherent resistance to injury and ability to recover (Brown and Kapler Smith 2000). Mortality of herbaceous species is more dependent on the length of time plants are exposed to high heat, determined by the amount of duff and woody fuel consumed by the fire, than flame length and fire line intensity (Armour et al. 1984). The effect of wildfire on herbaceous sensitive plant habitats therefore would depend on the surface fuel conditions. The longer fuels build up on the forest floor, the greater the potential damage to herbaceous sensitive plant habitats.

After habitat loss, the spread of invasive species is considered the greatest threat to imperiled species in the United States (Sieg et al. 2003). Large stand-replacing fires are known to increase the risk of infestation by noxious weeds (D'Antonio 2000). Thus included with the potential for large-scale fire is the risk of noxious weed infestation. Of course, fires are not the only cause of weed infestations; any time the ground is disturbed (such as with the activities proposed under the action alternatives) there is the potential for infestation. Noxious weeds cause habitat degradation because they can out-compete desired plant species for water and nutrients. Drift from herbicides sprayed to help control weeds can also have detrimental effects to herbaceous sensitive plants. This risk is reduced by adhering to label instructions for applying specific herbicides, and by application of project design feature NOX-6 that requires a 100-foot buffer around sensitive plant species when applying herbicides. Within this buffer, only hand-pulling of weeds would be allowed (USDA Forest Service 2006c, d).

Effects specific to whitebark pine

Whitebark pine in the Northern Rocky Mountains depends on fire to maintain its dominance or presence on sites where it is a successional species (see the Vegetation section). Therefore if a large, stand-replacing fire occurs, whitebark pine may benefit because sites suitable for regeneration would be created. If, however, no seed source is nearby to facilitate the regeneration, such a fire could largely eliminate this sensitive species from the area. As is noted in the Vegetation section, the increases in fuel loads threaten the survival of even the largest and most fire-resistant whitebark pine trees.

Whitebark pine has been declining throughout major portions of its range for the last 50 years due to the effects of diseases, insects, and succession (Amell and Klug 2015). Although the action alternatives may reduce the effects from these threats they cannot eliminate the threats, therefore effects from diseases, insects and succession are common to all alternatives. Please see appendix B for a detailed discussion of these threats.

Effects Common to All Action Alternatives

The effects of ground disturbance on herbaceous sensitive plant populations would be similar in all action alternatives. There are no known occurrences of herbaceous sensitive species in the project area; however, if unknown occurrences are present those plants may be directly impacted by ground-disturbing activities. Effects from ground disturbance include the risk of noxious weed infestation as discussed earlier in the section *Effects Common to All Alternatives*, as well as direct impacts such as trampling, defoliation, soil and vegetation compaction and mechanical damage. These effects may be detrimental to individual plants as well as to the habitat for the sensitive plants. There is a project design feature in place that would reduce the risk of impacts by requiring appropriate mitigation if a population is located within the project area:

- If sensitive plant populations, except whitebark pine (see SILV-2), are located within the project area appropriate mitigation (e.g., site avoidance, avoid concentration of fuels on sites to be burned) would be followed upon consultation with a Forest Service botanist.

There are known occurrences of whitebark pine in the proposed treatment areas of both action alternatives. Those occurrences would be protected by the project design feature SILV-2, which is designed to protect whitebark pine individuals and enhance habitat for the species. Thus, while there is the potential for individuals to be charred or physically damaged during the treatment, beneficial effects (in the form of habitat enhancement due to the removal of shade-tolerant species and creation of caching sites for Clark’s nutcrackers) are expected in the long term. Incorporation of design feature SILV-5 increases the beneficial effects to whitebark pine as the Forest Service seeks opportunities to plant rust-resistant individuals. The Vegetation section states that whitebark pine would increase in the short term with the increase extending into the long term under both action alternatives.

Alternative 1– No Action

Direct and Indirect Effects

There would be no direct effects to any of the sensitive species under alternative 1, since none of the proposed treatments would occur. Current management would continue. Alternative 1 does not propose activities to modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Current management activities would not reduce potential for stand-replacing wildfire events in the treated stands or help to break up the structure in the project area. Consequently, there is potential for indirect effects from wildfire as discussed earlier under *Effects Common to All Alternatives*.

Amell and Klug (2015) state in the Silviculture section that whitebark pine are expected to decline with the continuation of current management. Rather than reiterate that information, it is incorporated here by reference.

Irreversible/Irretrievable Commitments

There are no irreversible or irretrievable commitments that would affect sensitive plants under this alternative.

Cumulative Effects

There are policies in place that reduce or eliminate impacts from management activities on sensitive species (USDA Forest Service 2005). Therefore, the effects expected from this alternative when combined with the effects from the other management activities past and future, are not expected to contribute to change in status or viability of sensitive plants. In addition, cumulative effects are not expected to contribute to an increase in current or predicted downward trends in population numbers or habitat capability that would reduce the existing distribution of any of the R1 sensitive plant species discussed in this analysis, under this alternative. This conclusion applies the analysis indicators for direct and indirect effects (i.e. potential for direct physical impacts of trampling and defoliation, and potential for habitat degradation due to infestation of invasive species) from the proposed activities and adds them to expected effects from other management activities.

Cumulative effects from the following activities across the planning area are not anticipated:

- A roadside hazard tree removal projectoccurred along the main roads in this project area. The ground disturbance associated with that activity would be monitored and treated per the Helena National Forest Noxious Weed Record of Decision (2006d).
- Livestock grazing within the analysis area would continue as identified in the Allotment Management Plans for the Stonewall, Keep Cool and Arrastra allotments. There are no known occurrences of sensitive species within these allotments. Known sensitive plant populations on the forest, outside the project area, have not shown adverse effects from grazing and would not be affected by fuel treatment activities from this project.
- Timber harvest and thinning (fuels reduction) has led to changes in forest composition, structure and fire frequency. There are no known sensitive plant species in the project area that occur in areas that have been harvested or thinned. There are areas outside the project area where known sensitive plant species occur within past harvest treatment areas, however, those occurrences would not be affected by treatment activities from this project.
- Motorized and nonmotorized recreational use has led to the development of nonsystem roads and trails, development of dispersed campsites, erosion, and vectoring of noxious weeds into areas not previously infested. These activities can lead to physical damage to plants and their habitats (biomass removal, vegetation compaction and ground disturbance). Vehicles and people help to spread noxious weeds by carrying weed seeds into new areas. These impacts are controllable through area closures and travel management.
- Road and trail construction and maintenance causes soil disturbance and erosion, fragmentation and destruction of habitat, and noxious weed invasion. It also increases the impacts from recreational activities by allowing improved access for those activities. Known sensitive plant locations outside the project area would not be affected by activities associated with proposed roadwork from this project. If any populations are discovered associated with ground disturbing activities, they would be protected. Populations would also be protected from herbicide application.
- Fire suppression has led to increased fuel loading, canopy closure, and higher intensity wildfire. Fire is a natural disturbance in the ecosystem. In some areas, habitat succession and fire could possibly create or improve habitat for select plant species by opening up meadows or reducing the litter accumulation and competition from other plants. In other areas, wildfires or controlled fires would create high ground temperatures that could sterilize the soil and eliminate fungal species that are necessary for the survival of others. Whitebark pine is dependent on fire to maintain its presence in the project area (Amell and Klug 2015). Fire exclusion has allowed an increase in competition from shade-tolerant species. Fire also tends to favor post-fire germination of nonnative species in environments where nonnatives are abundant and/or native species are stressed.
- Trends in climate change indicate the future precipitation levels will be lower and temperatures will be higher than the current long-term averages. Drier conditions are expected to be detrimental to riparian species that depend on moist habitats. Warmer temperatures are expected to result in a change in the distribution of plants as the elevation at which plants are found shifts upward. This shift appears to be greater for species found in mountain habitats (Lenoir et al. 2008). Modeling predicts a

decline in whitebark pine due to global increase in temperature and more frequent summer droughts. However it's also predicted that there will be an expansion of whitebark pine due to more frequent fire return intervals resulting from global warming (Fryer 2002).

- Noxious weeds would continue to be treated as specified in the Helena National Forest Noxious Weed FEIS and Record of Decision (USDA Forest Service 2006d). While herbicides used in treating noxious weeds may be inherently harmful to herbaceous plants, the existing Forest program as many safeguards in place to prevent detrimental impacts to sensitive species.

The actions and effects described in this section can be both additive and interactive to each other and to the direct and indirect effects described above. As stated earlier, because current management direction is designed to eliminate or reduce negative cumulative impacts by protecting sensitive plants from direct and indirect impacts, the cumulative effects to all species discussed in this analysis are expected to be minimal.

Alternative 2 – Proposed Action

Project Design Features Common to All Action Alternatives

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to plants and other resources is displayed in table 9, chapter 2.

The specific design feature in table 9 pertaining to plants is BOT-1 that addresses all alternatives, all units

This analysis is based on the implementation of all design features. Project design features apply to both action alternatives. Design features that are applicable to sensitive plant species include not only those listed above, designed specifically to protect sensitive plant species but also those designed to protect other resources.

Direct and Indirect Effects

Because no herbaceous sensitive species are known to occur in the proposed treatment areas, direct effects to the herbaceous sensitive species are not expected.

Whitebark pine is known to occur in five units as shown in table 140. Please note the "Acres in Unit" does not reflect total acres of whitebark pine, but rather the total acres of the unit of which whitebark pine is a component. And while it is known that whitebark pine occurs in these units, it may also occur (as scattered individuals) in other units. These acres are used as a basis for comparing alternatives. Under Alternative 2, prescribed fire treatment is proposed on 2,557 acres, in which whitebark pine is a component of the species composition. As discussed under *Effects Common to All Action Alternatives*, those occurrences of whitebark pine would be protected by the project design feature SILV-2 (table 9, chapter 2). Under this alternative whitebark pine is expected to increase in the short term, with the increase extending into the long term (Amell and Klug 2015). Please see appendix B for details of effects to whitebark pine.

Table 140 Treatment units with whitebark pine present – Alternative 2

Unit Id	Acres In Unit	Proposed Treatment
76	123	prescribed fire
79	337	prescribed fire
82	776	prescribed fire
83	457	prescribed fire
88	864	prescribed fire
Total acres	**2,557**	

There is a potential for indirect effects from wildfire as discussed under *Effects Common to All Alternatives*. The risk of effects from wildfire (including the connected noxious weed infestation) is less under alternative 2 than under alternative 1, as the proposed actions are designed to meet the purpose and need by modifying fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. The proposed actions are meant to reduce potential for stand-replacing wildfire events in the treated stands, as well as break up the structure in the project area. Reducing potential for stand-replacing events may reduce wildfire impacts to sensitive plants.

Potential habitat degradation due to noxious weed infestation as a result of ground disturbance is greater under alternative 2 than alternative 1. The Invasive Plants section identifies the potential for an additional 427 acres of potential weed infestation due to the proposed activities. This does not mean 427 acres of sensitive species habitat would be infested, but rather the risk of infestation of sensitive species habitat is greater under alternative 2 because of the potential increase of weeds in the area.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments that would affect sensitive plants under this alternative when project design features are applied.

Cumulative Effects

The cumulative actions and resulting cumulative effects as discussed under alternative 1 also apply to alternative 2. There would be no cumulative effects for this alternative as no known herbaceous plant populations would be affected, and there is a project design feature in place to protect whitebark pine. See also the discussion of cumulative effects due to indirect effects under alternative 1.

Alternative 3

Direct and Indirect Effects

Direct and indirect effects to sensitive species and their habitats under alternative 3 are expected to be the same as under alternative 2 except as follows:

- The risk of indirect effects from wildfire (including the connected effect of noxious weed infestation because of such fires) is greater under alternative 3 than alternative 2, because fewer acres are proposed for treatment, leaving a slightly greater potential for a large stand-replacing fire.
- Conversely, the risk of habitat degradation due to noxious weed infestation is less under alternative 3 than alternative 2 because ground disturbing activities would occur on fewer acres. Please see the Invasive Plants section for details of potential weed infestation due to proposed activities. Table 141 shows the comparison of potential weed infestation for all alternatives:

Table 141 Comparison of potential weed infestation due to proposed activities

Alternative	Acres Of Potential Weed Infestation Due To Proposed Activities
1	0
2	427
3	307

- Four of the five units which have whitebark pine as a component would be treated with prescribed fire under alternative 3. There is no treatment proposed for Unit 76, so 123 fewer acres would be treated.

Irreversible/Irretrievable Commitments

There are no irreversible or irretrievable commitments that would affect sensitive plants under this alternative when project design features are applied.

Cumulative Effects

The cumulative actions and resulting cumulative effects as discussed under alternative 1 also apply to this alternative. There would be no cumulative effects for this alternative as no known herbaceous plant populations would be affected, and there is a project design feature in place to protect whitebark pine. Please see the discussion of cumulative effects earlier under alternative 1.

Summary of Effects

Alternative 1 would have no new soil disturbing activities that would disturb sensitive plant populations. However, alternative 1 does not propose activities that modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. Consequently, there remains a higher risk of a large, stand-replacing fire that could result in effects to herbaceous sensitive species habitat. The Vegetation section notes that under alternative 1 whitebark pine would not increase in the short term and would decline from present levels in the long term.

Alternative 2 has the highest level of soil disturbing activities with the highest level of potential to affect any unknown herbaceous sensitive plant populations. Nevertheless, alternative 2 addresses the purpose and need by proposing the greatest amount of acres of activities that modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape. The proposed actions are meant to reduce potential for stand-replacing wildfire events in the treated stands, as well as break up the structure in the project area. Reducing potential for stand replacing events may reduce wildfire impacts to specific resources. The Vegetation section states that proposed activities under alternative 2 are consistent with recommendations for restoration of whitebark pine ecosystems, and that in the treated areas whitebark pine would increase in the short term with the increase extending into the long term.

Alternative 3 also proposes treatment activities that may disturb unknown occurrences of herbaceous sensitive plants (see description for alternative 2), however on fewer acres than alternative 2. The Vegetation section states that proposed activities under alternative 3 are consistent with recommendations for restoration of whitebark pine ecosystems and that in the treated areas whitebark pine would increase in the short term with the increase extending into the long term.

There are no known occurrences of herbaceous sensitive plants in the project area and there is a project design feature in place to protect whitebark pine; therefore, direct and indirect effects are limited.

Cumulative effects are not expected to contribute to change in status or viability of sensitive plants, under any of the alternatives. No downward trend in population numbers or density, or downward trend in habitat capability that would reduce the existing distribution of any of the sensitive plant species discussed in this analysis, is expected under any of the alternatives.

Species-Specific Effects including Determination of Effects

Roundleaf orchid

This species is known from the Rocky Mountain Front and the northwest corner of Montana. Field surveys of potential wetlands within the analysis area did not locate any populations of this species. No other past surveys have located this species on the Helena National Forest. The habitat for this species is spruce forests along moist seeps and springs.

Direct, Indirect, and Cumulative Effects

Wetlands, seeps and springs would be protected from ground disturbance in the design features for this project (table 9); therefore, direct effects are not expected. However, when habitat is present for a species it is possible that unknown individuals are present, therefore, there is the remote chance, albeit very slight, that individuals could be directly affected. Indirect effects would be as described under *Effects Common to All Alternatives*. See *Cumulative Effects* section for alternative 1, and appendix C for specific cumulative effects.

Determination

Based on the analysis for alternatives 1, 2, and 3, detailed in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of roundleaf orchid. This determination is supported by the following rationale:

- None of the known occurrences of roundleaf orchid are within the project area and none would be impacted by this project.
- There may be habitat for roundleaf orchid in the project area and as a result there is a slight possibility that unknown individuals could be impacted
- There are project design features in place to protect this species' habitat.
- There is potential for indirect effects to habitat under all three alternatives. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large, stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Scalloped moonwort

This species is known from the Beaverhead-Deerlodge National Forest, immediately adjacent to the Helena National Forest. This species has not been found to date in the project area through numerous surveys. This species is associated with wetland habitats.

Direct, Indirect, and Cumulative Effects

Wetlands, seeps and springs would be protected from ground disturbance in the design features for this project; therefore, direct effects are not expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See *Cumulative Effects* section under alternative 1and appendix C for specific cumulative effects.

Determination

Based on the analysis for the three alternatives detailed earlier in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of scalloped moonwort. This determination is supported by the following rationale:

- ♦ None of the known occurrences of scalloped moonwort are within the project area and none would be impacted by this project.
- ♦ There may be habitat for scalloped moonwort in the project area and therefore. there is a slight possibility of unknown individuals that could be impacted
- ♦ There are project design features in place to protect this species' habitat.
- ♦ There is potential for indirect effects to habitat under all three alternatives. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large, stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Peculiar moonwort

Peculiar moonwort is known from two populations on the Helena National Forest, both in the Divide landscape area. The habitat for this species on the Helena National Forest is open grassland and open grassland and sagebrush. This habitat does not occur in treatment areas; no populations are known to occur in the project area.

Direct, Indirect, and Cumulative Effects

No treatments are proposed in potential habitat, and there are no known occurrences of this species in the project area, therefore, no direct effects are expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See *Cumulative Effects* section under alternative 1and appendix C for specific cumulative effects.

Determination

Based on the analysis for the three alternatives detailed earlier in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of peculiar moonwort. This determination is supported by the following rationale:

- ♦ None of the known occurrences of peculiar moonwort are within the project area and none would be impacted by this project.
- ♦ There may be habitat for peculiar moonwort in the project area and therefore there is a slight possibility of unknown individuals that could be impacted
- ♦ There are no activities proposed in this species' habitat.
- ♦ There is potential for indirect effects to habitat from surrounding activities. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Lesser yellow lady's slipper

Montana Natural Heritage Program has records showing an occurrence of this species just inside the Helena National Forest boundary, and an occurrence just outside the boundary. Neither population has been seen recently. Field surveys in 2009 of potential wetlands did not locate any populations of this species. No other past surveys have located this species on the Helena National Forest. No populations are known to occur in the analysis area. The habitat for this species is fens, damp mossy woods, seepage areas, and moist forest-meadow ecotone, in the valley and lower montane zones.

Direct, Indirect, and Cumulative Effects

Wetlands, seeps and springs would be protected from ground disturbance in the design features for this project; therefore, direct effects are not expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See *Cumulative Effects* section under alternative 1and appendix C for specific cumulative effects.

Determination

Based on analysis for alternatives 1, 2, and 3 detailed in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of lesser yellow lady's slipper. This determination is supported by the following rationale:

- None of the known occurrences of lesser yellow lady's slipper are within the project area and none would be impacted by this project.
- There may be habitat for lesser yellow lady's slipper in the project area and therefore there is a slight possibility of unknown individuals that could be impacted
- There are project design features in place to protect this species' habitat.
- There is potential for indirect effects to habitat under all three alternatives. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Sparrow egg lady's slipper

Sparrow egg lady's slipper has not been found on the Helena National Forest but is known from Glacier National Park and northwest Montana. Field surveys in 2009 of potential wetlands did not locate any populations of this species. No other past surveys have located this species on the Helena National Forest. No populations are known to occur in the analysis area. The habitat for this species is mossy, moist or seepy places in coniferous forests.

Direct, Indirect, and Cumulative Effects

Wetlands, seeps and springs would be protected from ground disturbance in the design features for this project; therefore, direct effects are not expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See *Cumulative Effects* section under alternative 1and appendix C for specific cumulative effects.

Determination

Based on the analysis for alternatives 1, 2, and 3 detailed in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of sparrow egg lady's slipper. This determination is supported by the following rationale:

- None of the known occurrences of sparrow egg lady's slipper are within the project area and none would be impacted by this project.
- There may be habitat for sparrow egg lady's slipper in the project area and therefore there is a slight possibility of unknown individuals that could be impacted
- There are project design features in place to protect this species' habitat.
- There is potential for indirect effects to habitat under all three alternatives. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Howell's gumweed

This species has not been found in the Helena National Forest to date. It is known from open roadsides in the western Blackfoot area. The Montana Natural Heritage Program was contracted by the Forest Service to survey known noxious weed populations across the Forest (Barton and Crispin 2002). They specifically searched for this species. It was not found during those surveys as well as in 2009 field surveys. Habitat is described as vernally moist, lightly disturbed soils adjacent to ponds and marshes, as well as roadsides and other disturbed areas.

Direct, Indirect, and Cumulative Effects

It is unlikely that this species would occur in heavily forested areas where management activities are proposed; therefore, direct effects are not expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See *Cumulative Effects* section under alternative 1and appendix C for specific cumulative effects.

Determination

Based on the analysis for alternatives 1, 2, and 3 detailed in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of Howell's gumweed. This determination is supported by the following rationale:

- None of the known occurrences of Howell's gumweed are within the project area and none would be impacted by this project.
- There may be habitat for Howell's gumweed in the project area and therefore there is a slight possibility of unknown individuals that could be impacted
- It is unlikely this species would occur in areas where management activities are proposed.
- There is potential for indirect effects to habitat from surrounding activities. There are no activities associated with alternative; nevertheless, there is the possibility of habitat degradation due to the risk of large stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Hall's rush

This species has 15 populations Forestwide. The Montana Heritage database identifies eight populations on the Helena National Forest (three of the Heritage Program populations were located again by HNF crews). Seven new populations were found by Helena National Forest survey crews in 2009 (Bicker field surveys 2009). Habitat is wet to moist meadows.

Direct, Indirect, and Cumulative Effects

No treatments are proposed in potential habitat, and there are no known occurrences of this species in the project area; therefore, no direct effects are expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See the *Cumulative Effects* section for alternative 1, and appendix C for specific cumulative effects.

Determination

Based on the analysis for alternatives 1, 2, and 3 detailed in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of Hall's rush. This determination is supported by the following rationale:

- None of the known occurrences of Hall's rush are within the project area and none would be impacted by this project.
- There may be habitat for Hall's rush in the project area; therefore, there is a slight possibility of unknown individuals that could be impacted
- There are no activities proposed in this species' habitat.
- There is potential for indirect effects to habitat from surrounding activities. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large, stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Missoula phlox

This species is located in each of the four landscape areas of the Forest. The Montana Heritage database identifies eight populations on the Helena National Forest. The habitat for this species is open, exposed limestone-derived slopes in the foothills, to exposed ridges in the subalpine zone.

Direct, Indirect, and Cumulative Effects

No treatments are proposed in potential habitat, and there are no known occurrences of this species in the project area, therefore, no direct effects are expected. Indirect effects would be as described under *Effects Common to All Alternatives*. See the *Cumulative Effects* section under alternative 1, and appendix C for specific cumulative effects.

Determination

Based on the analysis for alternatives 1, 2, and 3 detailed in this document, I determine that the activities proposed **may impact individuals but would not contribute toward a trend for federal listing or loss of viability** of Missoula phlox. This determination is supported by the following rationale:

- None of the known occurrences of Missoula phlox are within the project area and none would be impacted by this project.
- There may be habitat for Missoula phlox in the project area; as a result, there is a slight possibility of unknown individuals that could be impacted
- There are no activities proposed in this species' habitat.
- There is potential for indirect effects to habitat from surrounding activities. There are no activities associated with alternative 1; nevertheless, there is the possibility of habitat degradation due to the risk of large stand-replacing fires and the associated habitat degradation from noxious weed infestation.

Whitebark pine

This species is a hardy conifer that tolerates poor soils, steep slopes, and windy exposures and is found at alpine tree line and subalpine elevations throughout its range (USDI Fish and Wildlife Service 2011a). It is known to occur in almost all major mountain ranges of western and central Montana. In the project area it is known to be a minor component in several of the treatment units. The Vegetation section contains additional information regarding this species; that information is incorporated here by reference,

Direct, Indirect, and Cumulative Effects

This species is known to occur as a minor component in treatment units 76, 79, 82, 83 and 88 (please see the Silviculture section for details). Those occurrences would be promoted by the project design feature SILV-2 which is designed to protect whitebark pine individuals and enhance habitat for the species. And SILV-5 capitalizes on opportunities to plant rust-resistant individuals. Thus, while there is the potential for individuals to be charred or physically damaged during the treatment, beneficial effects (in the form of habitat enhancement due to the removal of shade-tolerant species and creation of caching sites for Clark's nutcrackers) are expected in the long-term. Indirect effects would be as described under *Effects Common to All Alternatives*. The Vegetation section states that whitebark pine would not increase in the short term and would decline from present levels in the long term under alternative 1, and would increase in the short term, with the increase extending into the long term under alternatives 2 and 3. The proposed actions under both alternatives are consistent with recommendations for whitebark pine restoration (see appendix B). See *Cumulative Effects* sections for alternative 1, and appendix C for specific cumulative effects.

Determination

Based on the analysis for alternatives 1, 2, and 3, detailed in this document, I determine that the activities proposed may **impact individuals but would not contribute toward a trend for federal listing or loss of viability** of whitebark pine. This determination is supported by the following rationale:

- Whitebark pine is expected to decline within the project area under alternative 1 (Amell and Klug 2015). However, this project area makes up a very small portion of the range of the species, and a decline of the individuals in this project area cannot be determined to result in a trend towards federal listing or a loss of viability.
- Whitebark pine occurs as a minor component within some units that are proposed for prescribed burning under both action alternatives. Project design feature SILV-2 was designed to protect the species while incorporating activities to enhance the habitat. While some individuals may be impacted by these activities, overall a beneficial effect is expected in the long term.
- Project design feature SILV-5 allows for opportunities to plant rust-resistant individuals.
- Amell (2012) states that the activities proposed by the action alternatives are consistent with recommendations for restoration of whitebark pine ecosystems and that in the treated areas whitebark pine would increase in the short term with the increase extending into the long term.

Summary of Determinations of Effects

Table 142. Summary of determination of effects

Species **Common Name (Family)**	**Determination Of Effects**		
	Alternative 1	**Alternative 2**	**Alternative 3**
Amerorchis rotundifolia Roundleaf orchid (Orchidaceae)	MII[29]	MII	MII
Botrychium crenulatum Scalloped moonwort (Ophioglossaceae)	MII	MII	MII
Botrychium paradoxum *Peculiar moonwort* (Ophioglossaceae)	MII	MII	MII
Cypripedium parviflorum *Lesser yellow lady's slipper* (Orchidaceae)	MII	MII	MII
Cypripedium passerinum Sparrow egg lady's slipper (Orchidaceae)	MII	MII	MII
Grindelia howellii Howell's gumweed (Asteraceae)	MII	MII	MII
Juncus hallii Hall's rush (Juncaceae)	MII	MII	MII
Phlox kelseyi var. *missoulensis* Missoula phlox (Polemoniaceae)	MII	MII	MII
Pinus albicaulis Whitebark pine (Pinaceae)	MII	MII	MII

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Whitebark pine is the only sensitive plant species that has been found to date in the project area. All alternatives are consistent with Regional direction, Forest Plan Standards and Guidelines and the *Endangered Species Act*. If any additional species of special concern were verified in the project area, appropriate measures would be taken.

[29] May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Noxious Weeds

Introduction

This section addresses the effects of the proposed activities on noxious weeds within the Stonewall Project area. Noxious weed infestations are detrimental to native fauna and flora and present the greatest large-scale threat to native ecosystems that exist in the Nation's wild lands today (DiTomaso 2000; Lodge and Shrader-Frechette 2003; Lonsdale 1999; Mack et al. 2000; Pauchard et al. 2003). At high infestation levels, these effects are adverse due to the loss of native plant diversity, reduction of wildlife habitat and forage, increase in erosion and depletion of soil moisture and nutrient levels (DiTomaso 2000). There are approximately 564 acres of weeds mapped on National Forest System land within the Stonewall Project boundary. Figure 112 shows the general distribution of noxious weeds. These infestations are expected to spread, with the amount of spread increasing proportionally with the amount of ground disturbance.

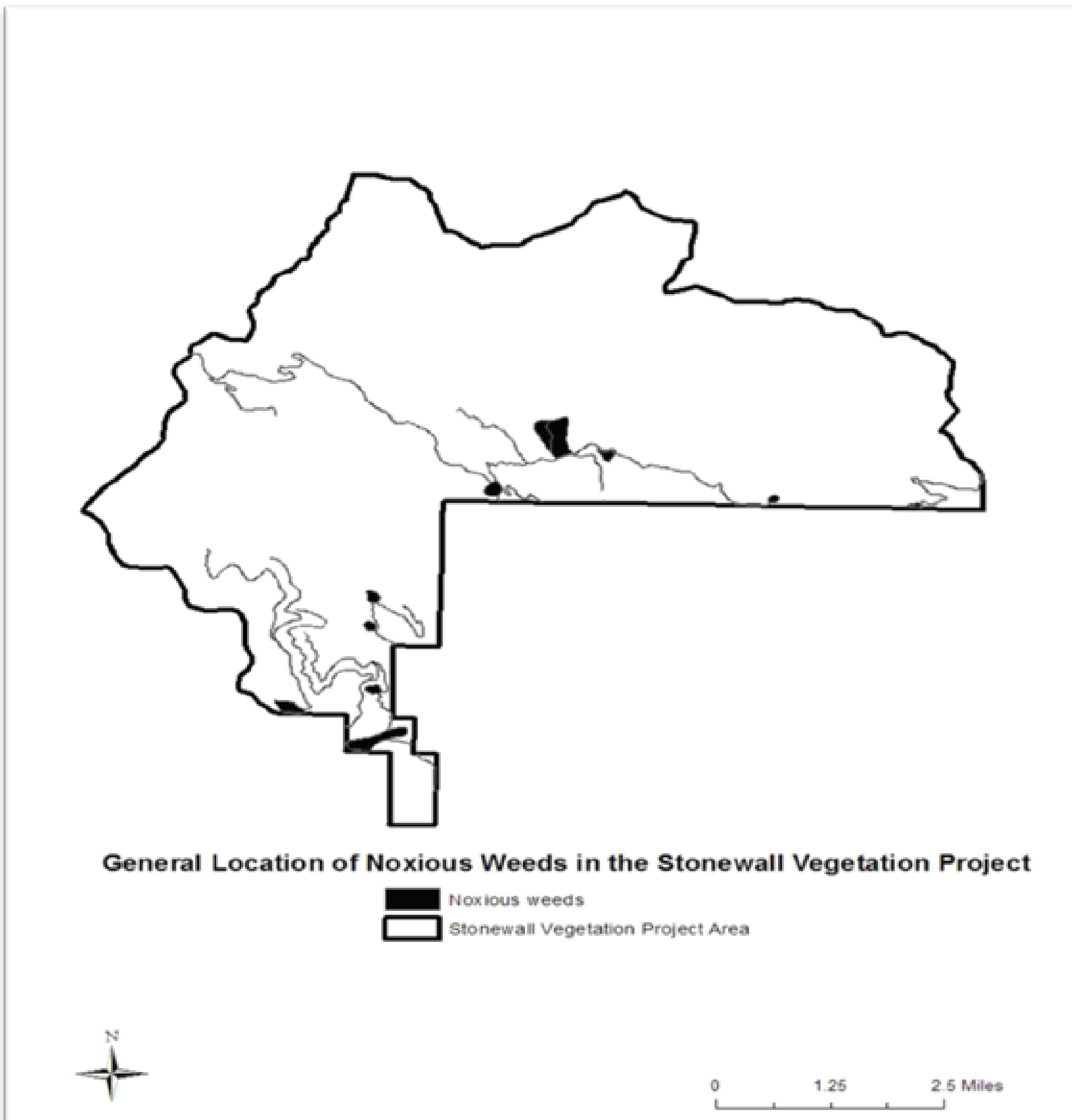


Figure 112. General location of noxious weeds in the Stonewall Vegetation Project area

Methodology

The methodology used in this analysis includes the best available data from the Helena National Forest Weeds Database and Geographic Information System (GIS) datasets. In addition, this analysis incorporates data collected by local Forest Service personnel during ground reconnaissance of the project area, and during vegetation monitoring of past vegetation treatments. Geographic Information Systems combine various datasets to help us understand relationships and the effects of travel routes on weeds and other flora, as well as influences from landform and landtypes.

Information Used

A GIS geodatabase (StonewallNEPA.gdb) contains numerous geospatial layers that provide the base data used in this analysis. This geodatabase is available in the project file located at the Helena National Forest or Lincoln Ranger District in Lincoln, Montana. Those layers include the known locations of weed infestations, watershed and stream information, and habitat types for risk assessment.

Assumptions

The following assumptions apply to this analysis:

- The analysis and decisions made in the record of decision for the Noxious Weed Treatment Project EIS are incorporated in noxious weed analysis and implementation on the Helena National Forest.
- Any soil disturbing activity with mechanized equipment has the potential to increase noxious weed invasion or spread.
- The expected rate of spread of noxious weeds is 14% per year, (Asher and Spurrier1998) without disturbance. The rate of spread could be even higher in areas affected by ground disturbing activities.
- Herbicide use in accordance with the requirements specified in the *Final Environmental Impact Statement: Helena National Forest Noxious Weed Treatment Project* and accompanying *Record of Decision (*USDA Forest Service 2006d) is appropriate for noxious weed management on infested lands.
- The Forest treats approximately one-third of its mapped weeds on an annual basis under its normal weed treatment program; therefore for this analysis it is assumed that one-third of the acres of weeds, would treated annually.
- The paragraphs below define mapped weed acres and weed treatment acres as used in this analysis.
    - **Mapped Weed Acres:** Mapped acres are reflected by polygons containing at least 1percent noxious weed cover. There are weeds outside those polygons that are too scattered to map, or are infestations that have not been discovered yet. The mapped acres are from the weeds layer in the Forest GIS database.
    - **Weed Treatment Acres:** Weed treatment acres for the purposes of this analysis are assumed to be the total polygon acres described above, to assess if any thresholds are being approached. Actual chemical application is reported to the State of Montana annually, as a requirement of a chemical applicator's/operator's license. Pesticide application is also recorded in the National Forest System FACTS database.

Spatial and Temporal Context for Cumulative Effects Analysis

The cumulative effects analysis area is the project area (figure 112). This geographic bounding was determined because activities beyond this boundary would have diminished effects. There are proposed haul routes identified that extend beyond this boundary, but expanding the analysis area to include those routes beyond the project area would result in an analysis of effects that is so subjective and conjectural that it would not contribute useful information. The analysis is bound in time by 10 years into the future, which allows for an adequate length of time to record vegetative changes. Effects associated with various actions are based on literature, known weed infestations and personal experience. Indicators, assumptions and method of analysis are the same as those described earlier.

Overview of Issues

The effects of project activities on noxious weeds were identified from public scoping as significant. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition.

Weed Spread/Infestation: Proposed actions, including harvest disturbance and use of haul routes in areas with weeds present, may disturb landscapes allowing existing weed populations to expand or allowing additional species to become established.

Treatment of existing weed infestations would occur under the guidance of the Forestwide effort and treatments to prevent the spread of weeds is included in design features to reduce potential spread.

Issue Indicators

Indicators used to disclose the differences between the alternatives are:

- Predicted acres of invasive plants infestation due to the proposed treatments;
- Associated management cost for weed control activities.

Affected Environment

Existing Condition

Weeds have been expanding on the Helena National Forest for many years. A variety of factors contributed to the spread of noxious weeds. Noxious weeds are invasive by definition, and are able to spread without natural enemies, pathogens or ungulate grazing to keep them in check. Weeds favor disturbance caused by wildfire and ground disturbance of any kind. Increased public use across the Forest in the past few years due in part to off-road vehicle use and recreation displacement from wildfire, as well as travel plan closure areas, places more pressure on the remaining open areas.

Various methods of weed control are used on known weed infestations across the Helena National Forest (please see Appendix A in the Noxious Weeds Report (Englebert 2015a) for an estimate of costs for various control treatments). Herbicide application is the most common form of control used across the Forest. The Forest generally treats approximately 3,900 acres of weeds annually (averaging 2007 through 2009 as typical years). Although herbicide application has been the primary noxious weed treatment method, the Forest has also conducted a number of biological control agent releases and has established numerous insectaries across the Forest.

Partners and volunteers such as the Rocky Mountain Elk Foundation, Backcountry Horsemen, ATV groups, and Powell County and Lewis and Clark County participate with the Forest in weed treatment annually. The budget allocated for noxious weed treatment in 2009 was $335,000 with a target to treat approximately 3,000 acres. In addition, numerous grants and volunteer contributions assist the budget to help the Helena National Forest treat weeds.

Species information

Montana currently has 24 species on the statewide noxious weed list (Grubb et al. 2003). Five of those species are known to occur within the analysis areas: butter and eggs (*Linaria vulgaris*), Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*), St. Johnswort (*Hypericum perforatum*) and spotted knapweed (*Centaurea maculosa*). Common mullein (*Verbascum thapsus*)is listed as a noxious weed by Lewis and Clark County. In addition to the known (mapped) infestations, it is likely that oxeye daisy (*Leucanthemum vulgare* also known as *Chrysanthemum leucanthemum*) and cheatgrass (*Bromus tectorum*) occur along roadways, especially near areas of recent disturbance. The State of Montana lists oxeye daisy as a noxious weed and cheatgrass as a regulated species. Noxious weed infestations throughout the project area range from areas of 5 to 10 individual weed plants to linear patches along roads and trails to large patches of greater than 20 acres. Infestation levels range from light (1 percent canopy cover) to high (greater than 50% canopy cover). Table 143 shows the acres of weeds that are mapped in the project area. Infestation acres are rounded to the nearest acre.

Table 143. Mapped noxious weed infestation in the analysis areas

Noxious Weed Species (Scientific Name)	Project Area Infested Acres by Species
Butter and eggs – also known as yellow toadflax (*Linaria vulgaris*)	156
Canada thistle (*Cirsium arvense*)	118
Common mullein (*Verbascum thapsus*)	148
Houndstongue – also known as gypsyweed (*Cynoglossum officinale*)	126
St. Johnswort (*Hypericum perforatum*)	8
Spotted knapweed (*Centaurea maculosa*)	554
Total infested acres*	**564**

*Total infested acres do not equal the sum of all acres infested by a particular species. When a polygon is mapped and it contains multiple species, acres are recorded for each species.

Butter and eggs (*Linaria vulgaris*) is also known as yellow toadflax. It has been shown to readily establish on open and disturbed sites where competition from other plants is reduced (Zouhar 2003). Butter and eggs seeds may be dispersed by water, ants, birds, and rodents, but existing infestations appear to expand mainly by vegetative reproduction rather than by seed (Pauchard et al. 2003).

Canada thistle (*Cirsium arvense*) spreads primarily by adventitious root buds that may form new adventitious shoots that can develop along the root at any location (Zouhar 2001a). Canada thistle is present in much of the project area, generally associated with roadside disturbance or harvest disturbance. Its habitat is restricted to open areas of less than 10 percent canopy closure.

Cheatgrass (*Bromus tectorum*) is a serious weed that competes with native vegetation and fuels wildfire (Young et al. 1987). Cheatgrass has not been mapped on the Forest but is established along numerous roadsides and other areas of disturbance. Cheatgrass spread rapidly through sagebrush ranges following World War II and has been expanding its range ever since (Menalled et al. 2008). Cheatgrass is highly adaptable and has increased around the Helena National Forest over the past 30 years as evidenced by data collection (Olsen, personal observation). It is listed in Montana as a regulated plant.

Common mullein (*Verbascum thapsus*) is listed as a noxious weed in Lewis and Clark County. It has recently been mapped along roads in the project area. Gucker (2008) considers common mullein a short-lived member of disturbed communities whose abundance decreases with increased time since disturbance. Common mullein reproduces entirely by seed and has no means of vegetative regeneration. Its seed bank is very persistent, with seeds germinating after 100 years or more in the soil (Gucker 2008).

Houndstongue (*Cynoglossum officinale*) is also known as gypsyflower. This species is common along roads and in logged areas. Houndstongue is spread by large seeds that attach to animals or humans, as well as dispersed by wind (Zouhar 2002). A biennial or short-lived perennial, houndstongue reproduces only by seed. It is relatively shade tolerant, although it thrives in full sunlight. This species is difficult to map as it may occur in small, scattered patches.

Oxeye daisy (*Leucanthemum vulgare* also known as *Chrysanthemum leucanthemum*) is not mapped in the project area, but quite likely occurs in small infestations, especially near areas of past disturbance. Besides reproducing vegetatively along a rhizome, oxeye daisy is a prolific seed producer. This plant is capable of taking over and modifying natural areas, pasture and rangeland and may increase soil erosion compared to native plant communities (Olson and Wallander 1999).

St. Johnswort (*Hypericum perforatum*) is quite limited in the project area. St. Johnswort is often treated as a grassland plant, but it is also common in many forested areas in North America. It may occur in open forests, natural clearings, or within forests where canopy cover has been reduced or removed by disturbances. In forested areas St. Johnswort is commonly associated with disturbances such as roads, logging, grazing and fire. St. Johnswort reproduces by seed and by sprouting from lateral roots and root crowns. Seeds can remain viable in the soils for several years (Zouhar 2004).

Spotted knapweed (*Centaurea maculosa* also known as *Centaurea stoebe* ssp. *micranthos* and *Centaurea biebersteinii*) has the largest extent of infestation within both the project area and the cumulative effects boundary. The species occurs along roadsides and throughout south-facing areas of past harvest, as well as in the natural grasslands. Spotted knapweed thrives in open areas with forest canopies of less than 20 percent. Spotted knapweed reproduces almost entirely from seed. Plants are also able to extend lateral shoots below the soil surface that form rosettes adjacent to the parent plant. This species has also been shown to have allelopathic properties, secreting toxins that suppress the growth of other plants, although resource competition is just as effective in its ability to dominate areas (Zouhar 2001).

Environmental Consequences

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to noxious weeds and other resources is displayed in table 9, chapter 2.

The specific design features in table 9 pertaining to noxious weeds are NOX-1, NOX-2, NOX -3, NOX-4 NOX-5, NOX-6 and NOX-7.

This analysis is based on the implementation of all design features. Project design features apply to both action alternatives. Design features that are applicable to noxious weeds include not only those listed above, designed specifically to prevent noxious weed spread, but also those designed to protect other resources such as water and soil.

Effects Common to All Alternatives

The Forest treats approximately one-third of its mapped weeds on an annual basis under its normal weed treatment program (per the Helena National Forest Noxious Weed Treatment Project, USDA Forest Service1996). Therefore for this analysis it is assumed that one-third, or 188 acres of the 564 acres of weeds, would be treated annually. Herbicide treatment of these acres would have an average cost of about $30 per acre for easily accessible sites (up to 200 feet from a road and on slopes less than 40 percent) and $62 per acre for areas with more difficult terrain (farther than 200 feet from a road and on slopes greater than 40 percent). The cost of bio-control is included in these prices. An average cost of $50 per acre is used to calculate costs. Table 144 displays treatment type and cost to treat one-third of the acres in the project area. This table does not include the cost of monitoring. This cost is not included in further analysis of the alternatives as it is assumed to be a baseline, independent of management actions, and common to all alternatives.

Table 144. Treatment type and cost to treat one-third of the currently infested acres - all alternatives

Treatment Type	Cost/Acre	Acres	Total Cost
Herbicide/Bio-control	$50.00	188	$9,400

Noxious weed infestations adversely affect native fauna and flora and present the greatest large-scale threat to native ecosystems that exist in the nation’s wild lands today (DiTomaso 2000; Lodge and Shrader-Frechette 2003; Lonsdale 1999; Mack et al. 2000; Pauchard et al. 2003). At high infestation levels (canopy cover greater than or equal to 25 percent), noxious weeds cause a loss of native plant diversity, reduction of wildlife habitat and forage, increase in erosion, and depletion of soil moisture and nutrient levels (DiTomaso 2000). These effects are common to all alternatives and would vary depending on the level of infestation.

Weeds could potentially spread at a rate of 14 percent per year into dry forest areas as conifer species die and sunlight, nutrients, and moisture are more available to herbaceous plant species (Asher and Spurrier 1998). This is most important in ponderosa pine (*Pinus ponderosa*) forests, and lodgepole pine (*Pinus contorta*)/Douglas-fir (*Pseudotsuga menziesii*)/ponderosa pine mixed forests. The most susceptible forest habitat types would be dry habitat types that have existing infestations of noxious weeds because of the natural openness of such forest types.

Spotted knapweed, cheatgrass, Canada thistle, common mullein and houndstongue may spread rapidly with ground disturbance and may spread at a slower rate without disturbance (Young et al. 1987; Zouhar 2001, 2001a, 2002). Butter and eggs spreads readily without ground disturbance and very rapidly with disturbance (Zouhar 2003). The butter and eggs and oxeye daisy are of primary concern because they are difficult to control. Spotted knapweed is of primary concern across the analysis area because of the amount of infestation. New weed infestations, and spread of current infestations would occur under all alternatives, particularly along roadsides and areas of disturbance (Lonsdale 1999). The HNF Weed Treatment Project FEIS (USDA Forest Service 2006c) provides guidance and environmental requirements for weed control activities that would be applied to this area under any alternative. The Forest currently uses herbicides to treat approximately 30 percent of infestations annually. Roadsides would be treated annually, as they are a major vector for weed invasion. In addition to herbicide treatment, the noxious weed control program on the Forest has been successful in establishing insectaries. Biological control would be used in areas where the biological agents had optimal conditions for survival and expansion. In riparian areas, biological control would be emphasized where conditions for insect establishment are met.

A stand-replacing fire is a current risk in the Stonewall project area because of current fuels conditions (Kurtz 2009). Given the current conditions within the project area, and the dynamics associated with lodgepole and ponderosa pine mortality, untreated areas can be expected to experience uncharacteristically higher intensity fires that consume a considerable portion of duff and litter because of current density, stand structure, red-needled litter, and stand composition (Agee and Skinner 2005; Graham et al. 2004). This disturbance caused by wildfires would result in areas that are highly susceptible to weed invasions. For example, the Snowtalon fire occurred in an adjacent area in 2003. Much of that fire was stand-replacing. Yellow toadflax and spotted knapweed spread rapidly following the fire. Herbicides and biocontrol were applied aggressively in the three years following the fire, with follow-up treatments since that time.

The data on response of weeds and changes in weed ecology because of climate change are limited. Weeds are genetically diverse and if resources such as light, water, nutrients, or carbon dioxide change within the environment, it is more likely there may be an expansion of weeds. However, very little is known regarding the impact of climate change on the reproductive success of invasive weeds and the potential consequences for their management (Ziska 2006).

Native plant diversity would be impacted by infestations of nonnative plants, especially noxious weeds. Noxious weeds dominate plant communities and tend to form monocultures that negatively influence native biological diversity. This weed competition to individual plants and plant communities can result in loss of species diversity and sensitive native plants. Native grasses used for domestic livestock and wild ungulates have been particularly susceptible to impacts from weeds (Beck 2001).

A review of the mechanisms underlying exotic plant invasions by Levine and others (2003) revealed that although numerous studies have been done examining the effects of invasive plants on community structure and diversity, few studies have examined the underlying processes (e.g. competition, allelopathy, production of flammable biomass, nutrient cycling) that cause the impact. It is well understood that community biodiversity decreases with exotic plant invasion, but the results of changes to soil community diversity, resource allocation, and soil water availability for example have not been examined (Levine et al. 2003).

Some studies have investigated effects on nutrient cycling on invaders that are nitrogen fixers for example, as available nitrogen in that case might be predictable (Vitousek and Walker 1989). Evans et al. (2001) found that cheatgrass invasion can significantly alter nutrient cycling through differences in litter quality and quantity. However, the consequences of altered nitrogen availability for community structure are poorly demonstrated and highly variable (Levine et al. 2003).

Studies of impacts to natural fire processes strongly support the expectation that invader impacts on disturbance regimes (ecosystem process) can strongly and possibly irreversibly affect community structure (Levine et al. 2003). Dramatic alterations of fire frequency in historic shrublands that are now dominated by cheatgrass have been demonstrated (D’Antonio 2000, Ehrenfeld et al. 2001). Other cases of exotic grass and shrub impacts include increasing fuel resulting in greater flame lengths, higher temperatures and greater heat release. In each case, the mechanism through which impact develops depends on whether the invader can out-compete the natives for resources. In most cases, the specific ecophysiological reasons for greater biomass production have not been identified. The effects of cheatgrass strongly support the prediction that invaders affecting disturbance processes have the greatest potential to create large impacts on ecosystems (Vitousek 1990).

Allelopathy is a biological phenomenon by which one organism produces biochemicals that influence the growth, survival and reproduction of other plants. Ridenour and Calloway (2001) showed that spotted knapweed reduced the root growth of Idaho fescue (*Festuca idahoensis*) by 50 percent, showing an adverse allelopathic effect. Additional studies on the effect of arbuscular mycorrhizae on interactions of spotted knapweed—Idaho fescue roots showed an enhancement of the competitive ability of spotted knapweed but direct effects of mycorrhizae were weak (Marler et al. 1999). Unanswered questions in the ecosystem-impacts literature include the degree to which the documented impacts result simply from the addition of new functional traits brought in by the invader, or alternatively the reduction or elimination of native species (e.g., Mack et al. 2001).

The use of herbicides may have positive or negative impacts on native plant diversity. Rice and others (1997) found in a detailed comparison of plant community composition over an eight-year period that plots treated with Tordon®, Transline®, and Curtail® were more similar to the potential natural communities than the no-spray controls (Mueggler and Stewart 1980). On the other hand, the side effects of weed management can vary as a function of local site conditions (Shea et al. 2005). Side effects of management actions include reducing vigor or abundance of native or desirable species, inhibiting overall productivity or diversity, shifting community structure and function, and altering physical conditions (D'Antonio et al. 2004, Hulme 2006, Louda et al. 1997). Therefore, effective weed management requires weighing the success of control measures (e.g., impacts on target weeds and recovery of native species) against the side effects of management actions. This necessitates a thorough understanding of how management tools interact with non-target system components as well as the target weed (Shea et al. 2005).

The *Helena National Forest Weed Treatment Project FEIS* (USDA Forest Service 2006c) provides guidance and environmental requirements for weed control and treatment activities that would apply to this area in any alternative. All personnel using herbicides are appropriately certified by the State of Montana and knowledgeable about the environmental guidelines and requirements of the Noxious Weed EIS.

Effects Common to All Action Alternatives

While the spread of noxious weeds would continue under all alternatives, the rate of spread could potentially be faster in areas proposed for treatments, particularly areas to be thinned and burned. Weed management would continue as in the past, however, activities proposed for the Stonewall Project add a layer of ground disturbance and therefore requires additional management for weeds. Areas of ground disturbance would be monitored for weed infestations and treated as appropriate, in accordance with the Helena National Forest Weed Treatment Project FEIS (USDA Forest Service 2006c), Forest Service Manual 2900 (USDA Forest Service 2011), and the Forest Plan (1986). Chemical weed treatment would be the primary treatment method in areas that are accessible by spray equipment. Biological control would apply in areas where the biological agents have optimal conditions for survival and expansion. In riparian areas, biological control would be emphasized where conditions for insect establishment are met. The effect of all treatment methods would be to control and contain existing and new infestations related to vegetation treatments.

The most susceptible habitat types within the project area are the dry habitat types that have existing infestation of noxious weeds. Included are habitat types dominated by Douglas-fir or ponderosa pine. Thinning and burning have been shown to increase the abundance of invasive species in a similar dry (ponderosa pine) forest type in western Montana. Removing the overstory can increase the availability of limiting resources and allow weeds to thrive (Dodson et al. 2008). Metlen and others (2006) found that understory diversity increased following burning, and the increase was in both native and non-native species. Slash burning can also create localized areas that are conducive to the propagation of noxious weeds. Within these dry forest habitat types there are proposed thinning and burning treatment units with existing populations of weeds. These weed populations would likely expand with disturbance, but there are project design features in place to help minimize the likelihood of expansion.

Harvest units in moist forest, subalpine fir (*Abies lasiocarpa*) habitat types that would have closed canopies have a lower probability of weed infestation, particularly spotted knapweed. This species does not tolerate shading (Zouhar 2001). Canada thistle and houndstongue tolerate more shade than spotted knapweed, but the spread of these species is closely associated with ground disturbing activities (Zouhar 2001a, 2002). The probability of weed expansion in these areas would be the lowest of the proposed treatment areas.

Ground disturbance increases susceptibility to weed invasion. The tractor-based treatments would create moderate ground disturbance. It is estimated that 10 percent of acres treated with tractor-based treatments in alternatives 2 and 3 may be susceptible to new weed infestation. This estimate is supported by a study in four Washington Douglas-fir forests, in which exotic species percent cover averaged 10 percent in the first year following overstory thinning treatments (Thysell and Carey 2001). Areas most susceptible are the regeneration and intermediate treatments in the open canopy cover where ground disturbance would occur. Specific effects are described in the sections for alternatives 2 and 3.

The prescribed fire treatment, which is mixed or low severity, as opposed to high severity associated with wildfires, would not require the use of heavy equipment, and therefore would not result in removal of top soil. It is estimated that as a result of the prescribed fire treatment, approximately 1 percent –5 percent (mid-point of 3 percent) of the treated acres may become infested with noxious weeds. Understory burn treatments have been shown to result in a much smaller increase in exotic species infestation than combined thinning and burning (Dodson et al. 2008).

The 2006 EIS for treating weeds on the Helena National Forest (USDA Forest Service 2006c) identified several 6th code HUCs in which herbicide application would be limited based on the amount of herbicide applied, the location of the application, the stream flow, and HUC area. These estimates are shown by HUC, and the rationale for that determination is from the coarse filter calculation to estimate possible concentrations of herbicide in stream waters shown in appendix C.

Weed Control Methods and Costs

For all weed treatment cost estimates in this document, a figure of $30.00 per acre of treatment was applied for easily accessible areas, and $62.00 per acre of treatment for more difficult terrain, with an average of $50.00 per acre.

Table 145. Weed control methods and costs

Method	General Effectiveness	Cost per Acre
Ground application of herbicides with good vehicle access	High	$24.00–$115.00
Ground application with Truck, ATV, and some backpack treatment	High	$62.00
Ground application of herbicides using backpack and horse/mule pack equipment	High	$125.00-$350.00
Aerial application of herbicides	High	$18.00–$24.00
Biological control using insects at about $1.00 per insect; 40 insects per acre	Low to high	$40.00
Grazing	low	$20.00–$48.00
Hand pulling	High for small infestations of tap-rooted weeds, low for high density infestations or infestations of rhizomatous weeds.	$8,800.00

Table 145 was created in 2004. Due to fuel cost increases, it is estimated that the weed treatment costs have increased by 10 percent since that time. This table does not reflect the increases in treatment costs. (Table shown is from *Draft HNF Noxious Weed EIS* Table # 3-20)

Herbicide Application

Herbicide applications would follow guidance from the Forestwide Herbicide EIS (2006),which limits tordon applied within any specific 6th code hydrologic unit such that the projected levels of herbicide may reach surface waters would remain below 0.07 parts per million. The actual spreadsheet this table is copied from is included in the project record (pesticide_HUC6.xls).

Table 146 shows the individual 6th field HUCs that have weed infestations. The total HUC acres and acres of weed infestation inside of and outside of the 300-foot buffer are shown

Herbicide model calculations based on GIS data

				Overland flow or Infiltration (enter O or I):		O	0.02			21600	sec	
			Application rate:	0.25	lbs/acre							
6th HUC #	**6th HUC name**	**HNF acre**	**A <300'**	**A >300'**	**R**	**P**	**D**	**Y**	**F**	**T**	**C**	**M**
170102030303	Beaver Creek	11617	489.179	5.628	0.25	123.70175	0.02	2.4740	137	21600	184742856	0.013391776
170102030304	Keep Cool Cr	22834	519.694	105.037	0.25	156.18275	0.02	3.1236	181	21600	244076328	0.012797861
170102030305	Lincoln Creek	7551	289.695	16.707	0.25	76.6005	0.02	1.5320	74	21600	99788112	0.01535263

parameter	description
A <300'	total area treated (ac) within 300' of a stream
A >300'	total area treated (ac) further than 300' from a stream
R	application rate of ACTIVE INGREDIENT (lbs/ac)
P	total amount of active ingredient applied in watershed
D	delivery ratio (fraction of applied herbicide reaching surface waters)--2% for OF-dominated sites, 1% for infiltration-dominated sites
Y	maximum yield of active ingredient that could potentially reach surface waters
F	Q2 calculated from USGS basin-characteristic equations
T	delivery time of pesticide to stream channel (sec)
C	weight of diluting water (lbs)
M	maximum possible concentration of active ingredient (ppm)

Coarse Filter Calculation to Estimate Possible Concentrations of Herbicide in Stream Waters

Table 147. Parameter definition for coarse filter calculation

Parameter	Description
A <300 feet	total area treated (ac) within 300 feet of a stream
A >300 feet	total area treated (ac) further than 300 feet from a stream
R	application rate of active ingredient (lbs/ac)
P	total amount of active ingredient applied in watershed
D	delivery ratio (fraction of applied herbicide reaching surface waters)—2% for OF-dominated sites, 1% for infiltration-dominated sites
Y	maximum yield of active ingredient that could potentially reach surface waters
F	Q2 calculated from USGS basin-characteristic equations
T	delivery time of pesticide to stream channel (sec)
C	weight of diluting water (lbs)
M	maximum possible concentration of active ingredient (ppm)

Step 1: Determine P, the total amount of herbicide to be applied in a watershed.

P (lbs) = **R** (lbs/ac) x **A** (ac)

R is the application rate of active ingredient and **A** is the total acreage treated.

Step 2: Determine if the site would produce overland flow or allow infiltration.

Step 3: Determine **Y**, the maximum yield in pounds of herbicide that could potentially reach surface waters.

Y (lbs) = **P** (lbs from Step 1) x **D** (%).

D is the delivery ratio or the fraction of the applied herbicide reaching surface waters.

On sites producing overland flow (roadside and mod and high severity burned areas), delivery ratio (**D**) of 2% is used. Within 300 feet of perennial stream a **D** of 2% is also used to account for the herbicides that would come from ephemeral channels.

On sites likely to allow infiltration, a delivery ratio of 1% is used.

Step 4: Determine dilution capacity (**C**) in pounds of water.

C (lbs) = **F**(cfs) x 62.43 lbs/cubic feet of water x **T** (sec).

F is the flow rate of the stream is expressed in cubic feet per second. We used the Q2 at the points in the stream describe in the text. The Q2 was derived using USGS Regional Equations.

T is the period in seconds over which the flow discharge yielding herbicide is being estimated. The minimum delivery time for over land flow dominated systems is assumed to be six hours (21,600 sec), and 24 hours (86,400 sec) for infiltration dominated sites.

A cubic foot of water weighs 62.43 pounds.

Step 5: Estimate **M**, the maximum possible concentration in parts per million by combining the results from step 3 and 4 using the equation:

M (ppm) = (**Y/C**) x 1,000,000

Y is the pounds of herbicide that could reach the site give the attributes described above.

C is the pounds of water that would be diluting the herbicide

Step 6: Compare **M**, with the level that is considered to have very little risk. Such as 1/20th of the LC50.

The spreadsheets that contain the actual calculations can be found in the project file.

Native Seed Mixes

Dry Sites

Slender wheatgrass (*Elymus trachycaulus* ssp. *trachycaulus*) variety Pryor

Rate: 12 lbs PLS/acre $1.50

Idaho fescue (*Festuca idahoensis*) variety Joeseph or Nez Perce

Rate: 8 lbs PLS/acre $5.00

Bluebunch wheatgrass (*Agropyron spicatum* or *Pseudoroegneria spicata*) var Goldar

Rate: 12 lbs PLS/acre $7.50/lb

Moist Sites

Slender wheatgrass (*Elymus trachycaulus* ssp. *trachycaulus*) variety Pryor

Rate: 10 lbs PLS/acre $1.40

Mountain brome (*Bromus marginatus*) variety Garnet preferred, Bromar acceptable

Rate: 10 lbs PLS/acre ~$5.00

Blue wildrye (*Elymus glaucous*) variety Elkton preferred, Arlington acceptable

Rate: 10 lbs PLS/acre ~$5.00

Sandberg bluegrass (*Poa sandbergii*) variety Canbar or High Plains Germplasm

Rate: 5 lbs PLS/acre $3.75

Soil

Introduction

This section evaluates the soil conditions and discloses the potential direct, indirect and cumulative effects of the alternatives for the Stonewall Vegetation Project.

There has been extensive research into the management impacts on ashcap soils in the intermountain west. Recommendations to reduce compaction in ashcap soils are operating season limitations to periods of dry soils (less than 15 percent soil moisture content) or winter conditions, use of low-ground pressure machinery, and increasing spacing between trails (Page-Dumroese et al. 2007). Earlier reports for this project recommended winter conditions only for areas of ash-cap soils; however based on the research findings, it is recommended that the units be harvested during dry soil (less than 15 percent soil moisture content) or winter conditions as defined in the design criteria.

Landtypes (soils) have been characterized for the Stonewall Vegetation Project area in Soil Survey of Helena National Forest Area, Montana (USDA Forest Service and Natural Resources Conservation Service 2001). There are 15 soil units mapped within the project area, 10 of which would be affected by proposed vegetation treatment activities. A summary of key soil characteristics for the 10 landtypes affected by the Stonewall Vegetation Project area is displayed in table 148.

The Stonewall Project would comply with Region 1 Soil Quality Standards (R1 SQS (1999)) and the Helena National Forest Land and Resource Management Plan (1986) to limit detrimental soil disturbance. The silvicultural and fuels treatments proposed for each action alternative are not expected to adversely affect soil resources with the implementation of project design features as part of each alternative. A full listing of project design features that would be implemented with all action alternatives can be found in chapter 2, table 9 (for soils; S/WS/F-1 through 14).

Under alternative 2, twenty-eight proposed units (1, 4, 5, 9, 10, 11, 12, 13, 17, 19, 20, 21, 28, 29, 32, 37, 38, 40, 42, 43, 45, 46, 47, 49, 56, 57, 58, and 74) are anticipated to comply with R1 SQS with implementation of additional design features as described in the cumulative affects section for the alternative. The remainder of the units would comply with R1 SQS as proposed.

Under alternative 3, twenty proposed units (1, 4, 5, 9, 10, 11, 12, 28, 37, 38, 40, 42, 43, 46b, 47b, 47c, 57, 58, and 74) are anticipated to comply with R1 SQS with implementation of additional design features as described in the cumulative affects section for the alternative. The remainder of the units would comply with R1 SQS as proposed.

Detrimental soil disturbance would be a short-term impact because there would be a long-term trend for soil recovery through reclamation measures or natural recovery processes (i.e. frost heave bio-perturbation, biomass input and nutrient cycling). Soils would likely take at least 50 years for recovery to pre-disturbance conditions where reclamation measures would be implemented, such as on temporary and short-term specified roads and log landings. Soils would likely take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur such as on main skid trails and cable yarding corridors.

Nonetheless, all proposed actions for the Stonewall Vegetation Project have been designed to comply with R1 SQS to limit the area affected by detrimental soil disturbance through inclusion of resource protection measures and design features in all action alternatives (table 9).

Information Used

Information used in this analysis of soil resources is derived from a number of sources, which are described in detail where they are cited or used in this analysis. Only a summary of the primary sources of information used in this analysis is provided in this section. The reader will find more detail on information used in this analysis where it is cited.

The “Soil Survey of Helena National Forest Area, Montana” (USDA NRCS 2001) provides information on distribution of mapped soil units, which are termed landtypes, within the project area. This published “Soil Survey” meets National Cooperative Soil Survey Standards, and includes descriptions of soil types and their characteristics relevant to management activities.

This analysis uses results of soil monitoring, conducted in the Maudlow Toston Salvage Sale Area and Cave Gulch Salvage Sale Areas (USDA Forest Service 2003a, 2003b, and 2003c; Page-Dumroese et al. 2006), annual monitoring reports, state and national best management practices in order to predict detrimental soil disturbances amounts, evaluate implementation proposals and subsequent effectiveness of Best Management Practices (BMPs). Annual monitoring data across the Helena National Forest has occurred for similar activities on similar landtypes, aspects and positions employing the same or similar resource protection measures are most recently summarized in the FY2012 Soil Monitoring Report, which can be found in the project record. Other sources of information for evaluating effectiveness of BMPs are cited in this analysis.

Field work was conducted in 2009 to document the existing detrimental soil disturbance in units specified for ground-based activity. Units visited were prioritized based on where documented previous activity, as outlined in the FACTS database, overlapped with proposed mechanized harvest units (precommercial and commercial). The concept of prioritization of units by suspected levels of disturbance is consistent with sampling intensities specified in the Region 1 Approach to Soils Analysis Regarding Detrimental Soil Disturbance in Forested Areas, A Technical Guide – April 2011 (USDA Forest Service 2011). Ground work was conducted by Forest Service soil technicians. Additionally, the Forest soil scientist oversaw field work, accompanied the crews in the field regularly and performed quality control/quality assurance investigations on data collected to ensure compliance with all national, regional and Forest regulations. A summary of that field work is located in the project record with the Soils Resource Report (Farr 2015) and serves as the foundation for the cumulative effects analysis.

Surveys were completed in 2010 to collect additional information. Paced transects were used to measure ground cover, coarse woody debris, slopes, and any other pertinent soil observations. Coarse woody debris transects were established using a modified Brown’s line intercept method.

This paragraph contains information added between draft and final versions. There was one change in data collection for the FEIS: due to inconsistencies of field data collection results, detrimental soil disturbance calculations were remade for the final analysis. There were several units with documented past disturbance in the FACTS database, e.g., timber harvest and associated roads and skid trails, determined recovered to a point that no detrimental soil disturbance was documented following national and regional soil monitoring protocals. A variety of published scientific literature, relating to soils, and effects of timber harvest and prescribed fire, were reviewed for supporting information in this analysis. Literature reviewed for this analysis is listed in the references section in chapter 4.

Methodology and Scientific Accuracy

Forest Service Manual (FSM 2550): Soil quality standards for Region 1 (USDA Forest Service 2014) are used as threshold values to assess compliance of management activities with legal mandates to sustain soil productivity (16 U.S.C. 1600, 1976; USDA Forest Service 1986). Soil quality is maintained when erosion (less than 2 tons per acre), compaction, displacement, rutting, burning and loss of organic matter are maintained within defined soil quality standards. The soil quality standards state: “In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planed activity and should move toward a net improvement in soil quality.” Management goals should strive to create as little detrimental soil disturbance as possible, not just to keep from exceeding standards.

Intensively developed sites such as mines, recreation sites, administrative sites, and permanent roads and trails are areas dedicated for management uses other than vegetation production. Therefore, soil quality standards are not applied to these areas (USDA Forest Service 2014). Permanent roads do affect soil hydrologic function; however, road evaluation is more appropriately conducted on a watershed basis. This analysis will focus on detrimental soil disturbance resulting from Forest Service vegetation management activities within proposed vegetation treatment units.

Soil quality standards are to be applied to “activity areas” (USDA Forest Service 2014). The activity area is considered an appropriate geographic unit for assessing soil environmental effects, because soil productivity is a site-specific attribute of the land. Thus, the activity area will be used as the geographic unit to assess soil environmental effects for all action alternatives.

All temporary roads, proposed units, skid trails and landings are considered to be part of an activity area. Specified transportation facilities—areas administered by special use permit and dedicated trails—are excluded. These soil guidelines are to be applied for design and evaluation of vegetation management activities.

The Helena National Forest Plan provides guidance for soil management, which states, “…all management activities will be planned to sustain site productivity” (USDA Forest Service 1986, page II-26). The Helena National Forest Plan provides further guidance: “During project analysis, ground disturbing activities will be reviewed and needed mitigating actions will be prescribed. Areas of decomposed granite soils will be identified and erosion control measures planned prior to ground disturbing activities. To reduce sedimentation associated with management activities, the highly sensitive granitic soils, which cover about 20 percent of the Forest, will have first priority for erosion control” (USDA Forest Service 1986, page II-26).

The Helena National Forest uses the Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al. 2009) to monitor forest sites before and after ground disturbing management activities for physical attributes that could influence site resilience and long-term sustainability. The attributes describe surface conditions that affect site sustainability and hydrologic function. Monitoring the attributes of surface cover, ruts, compaction, and platy structure can also be used to generate best management practices that help maintain site productivity.

The Helena National Forest uses this protocol when evaluating physical soil disturbance in a forested setting to determine compliance with the Region 1 Soil Quality Standards (USDA Forest Service 2014) and the Helena National Forest Plan (USDA Forest Service 1986). These soil guidelines are to be applied for design and evaluation of management activities to ensure soil function and processes are maintained as outlined in FSM 2550 and FSH 2509.

The loss of surface organic matter can cause nutrient and carbon cycle deficits and negatively affect physical and biological soil conditions. The direct benefits of coarse woody material to soils can vary widely, depending on ecological type. Research guidelines such as those contained in Graham et al. 1994 should be used if more specific local guidelines are not available. These soil guidelines are to be applied for design and evaluation of vegetation management activities.

Rills, gullies pedestals and soil deposition are all indicators of detrimental surface erosion. Minimum amounts of ground cover necessary to keep soil loss to within tolerable limits (generally less than 2 tons per acres per year) should be established locally depending on site characteristics.

For this analysis, the Water Erosion Prediction Project (WEPP) (Elliot et al. 2000) model was used to predict sediment movement in proposed burning and harvest units, and to assess erosion potential. WEPP models are accurate to within plus or minus 50 percent (ibid.). We relied on literature reviews, field notes, geographic information system (GIS) data, Helena National Forest soil surveys (2001) and professional judgment to support reported conclusions.

Proposed treatment units with the same proposed activities (harvest and burning) were grouped together to determine detrimental soil disturbance because logging system design and resulting effects to the soil are the same for the same prescriptions. Detrimental disturbance resulting from temporary road construction was included when determining the anticipated DSD for the unit. This is consistent with the direction given by the Region 1 Approach to Soils Analysis Regarding Detrimental Soil Disturbance in Forested Areas, A Technical Guide – April 2011 (USDA Forest Service 2011). The following assumptions and calculations were used in estimating detrimental soil disturbance percentages for the project.

Ground Based (Tractor) Harvest/Precommercial Thinning (Tractor)

Predictions of detrimental soil disturbance (DSD) are based on calculations of skid trail disturbance and have been validated by monitoring conducted on the Helena National Forest (FY2012 Soil Monitoring Report). It is assumed that the magnitude of soil disturbance on areas affected by primary skid trails would constitute detrimental soil disturbance. The average spacing between skid trails in tractor harvest units is estimated to be 100 feet except where they converge. With an average width of detrimental soil disturbance at 10-feet, main skid trails would affect about 9.1 percent of the activity area in a tractor harvest unit logged during “summer conditions”. This is calculated using the following equation:

- % DSD = width of the skid trail in feet / [(width of skid trail in feet) + width of spacing between main skid trails in feet)] x 100 9.1% = 10 ft. / (10 ft+100 ft.) x 100

Monitoring conducted on the Helena National Forest in 2012 documented 7 percent detrimental soil disturbance on units that were logged with ground based equipment (tractor) during “summer conditions” (FY2012 Soil Monitoring Report).

Log Landings Associated with Ground Based Harvest

The average size of log landings is estimated ¼ acre (0.25 acres) for tractor logging units. It is assumed that one quarter of an acre log landing is needed for every 10 acres of harvested area. It is assumed that the magnitude of soil disturbance on area affected by log landings would constitute detrimental soil impacts. By calculating the detrimental disturbance with the following equation:

- % DSD = [(area of log landing in acres) ÷ (amount of harvested area per log landing in acres)] ×100 2.5% = [.25÷10] ×100

The detrimental soil disturbance associated with log landings is 2.5 percent which was validated by monitoring conducted on the Helena National Forest (FY2012 Soil Monitoring Report).

Skyline/Cable Yarding

Soil monitoring in the Maudlow-Toston salvage sale area found that detrimental soil disturbance in skyline yarding cable corridors affected approximately 4–5 percent of units when harvest occurred under summer conditions, which did not include areas of disturbance associated with log landings or temporary roads (USDA Forest Service 2003d).

With skyline cable yarding systems, log landings would generally be located on the shoulder of the road used to access the harvest unit. Because the cable yarding equipment would be set-up and operating on the access road prism, there would not be soil impacts from heavy equipment on the log landing sites. Therefore, detrimental soil impacts would be negligible in the log landing sites for cable yarding units.

Winter Logging (Skyline and Tractor)

Monitoring of the Maudlow-Toston and Clancy-Unionville Sale area, observations within skyline cable units harvested under winter conditions, documented that detrimental soil disturbance was negligible (i.e. not enough to be measurable).

For logging under "frozen conditions", the amount of area impacted by log skidding is predicted to be between 3-4 percent of the activity area based on monitoring conducted on the Helena National Forest (FY2012 Soil Monitoring Report). For the purpose of this analysis, 4 percent anticipated DSD was used in calculations.

Winter tractor logging and suspended log yarding methods (i.e. skyline cable and helicopter yarding) have less impact to soils compared to tractor skidding over bare ground (McIver and Starr 2000, 15-16 and 20).

Prescribed Fire

There are several activities that have varying effects on soils in the prescribed fire category. For all of the burning prescriptions described below, it is assumed that the percent of severely burned soil equates to the percent detrimental soil disturbance.

Slashing is assumed to have no detrimental soil disturbance as a result of mechanical (chainsaw) cutting of small diameter trees by personnel on foot.

Handpile burning focuses on a concentration of fuel accumulations in piles and high severity fire would occur in these piles. Monitoring conducted on the Helena National Forest (USDA FS, Helena FP 2005) documented that pile burning within units resulted in 0-3 percent detrimental soil disturbance. Detrimental soil disturbance associated with pile burning could be as much as 5 percent depending on the concentration of the piles within the activity area. Therefore the amount of detrimental soil disturbance associated with pile burning is predicted to be 5 percent.

Jackpot burning focuses on concentrations of natural fuel accumulations and/or slash after harvest or slashing. High severity fire would occur in the heavy fuel concentration burning locations; however this is predicted to affect no more than 5 percent of an activity area when considering the project design elements. Therefore the detrimental soil disturbance associated with jackpot burning is predicted to be 5 percent.

Broadcast burning/Site Prep is designed to reduce hazardous fuels and includes areas of low severity burn and mixed severity burning. When estimating soil effects resulting from prescribed burning, specifically mixed severity burning, occasionally burn plans will be designed to target the low end of mixed severity fire to ensure adequate soil cover is retained to guard against erosion in excess of 2 tons/acre. Mixed severity burning is designed to expose 5-25 percent bare soil. Targeting the low end of mixed severity burning would be designed to expose 5-10 percent bare soil. It is assumed that less than 2 percent of the area affected by a low severity fire would be severely burned and less than 10 percent of the area affected by a moderate severity fire would be severely burned (DeBano et al. 1998). Therefore a range of 2-10 percent detrimental soil disturbance is associated with broadcast burning.

Under burning is a low severity fire covering a majority of an activity area. Monitoring conducted on the Helena National Forest (USDA Forest Service 2005) documented that detrimental soil disturbance following under burning averaged 4 percent.

All these estimates are based on monitoring of similar activities across the Helena National Forest, occurring on similar landscapes; professional observation and experience in the field gained while evaluating forestry practices in other timber sale areas and prescribed fire projects.

Roads Built then Obliterated after Harvest

For the purpose of calculating predicted area of detrimental soil disturbance resulting from roads built then obliterated after harvest, estimates were made for average widths of specified roads (25 feet), which includes width of disturbance and the area affected by cut and fill slopes. With a width of 25 feet, 1 mile of road built then obliterated after harvest would equal 3 acres of detrimental soil disturbance.

- 3 acres = [(1 mile x 5280 feet/mile) x 25 feet] / 43560 sq. feet/acre

Data Assumption and Limitations

The existing and estimated values for detrimental soil disturbance are not absolute and best used to compare differences between alternatives. The calculation of ‘additional detrimental disturbance from a given activity’ is an estimate, because detrimental disturbance is a combination of such factors as existing groundcover, soil texture, timing of operations and equipment used, as well as skill of the equipment operator, the amount of wood to be removed, and sale administration. The detrimental soil disturbance estimates assume that best management practices would be applied and that soil recovery occurs over time.

Overview of Issues

Comments pertaining to disclosing the effects of project activities on soils were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition. Some comments indicated concern that roads built then obliterated immediately following timber removal, road reconstruction, and use of existing roads would adversely impact soils through compaction. See the Transportation section for information about roads and soil compaction.

Affected Environment

Existing Condition

Soil Characteristics

Landtypes have been characterized for the Stonewall Vegetation Project area in *Soil Survey of Helena National Forest Area, Montana* (USDA NRCS 2001). There are 10 landtypes mapped within the project area which would be affected by proposed vegetation treatment activities. A summary of key soil characteristics for the 10 landtypes is displayed in table 148.

The project area is within moraine-influenced footslopes and headwater areas of the Upper Blackfoot River Watershed. The overall topography of the project area is heavily influenced by glacial activity including scouring of residual bedrock and deposition of till material in valley bottoms and gentle hillslopes. Table 148 displays the characteristics for soils in the project units. These soil characteristics are defined by the Helena National Forest Soil Survey (USDA Forest Service and Natural Resource Conservation Service 2001). Approximately 21 percent of the soils are from glacial till, while the remaining 79 percent are from metasedimentary rock.

The glacial till material is coarse and unconsolidated, forming isolated wet areas that pose operational restrictions. The metasedimentary parent material does not have inherent management restrictions. Most of the soils in the project area are also skeletal in nature,[30] and several of the mapped units have a channery texture.[31] This suggested that the soils are resistant to compaction and resilient due to their coarse texture. However, approximately 44 percent of the area is mapped with a volcanic ashcap, which poses operational limitations due to the compaction potential in these areas. The ashcap soils have a compactable silt-loam texture over the skeletal subsoil. The ashcap soils have a higher water-holding capacity, which tends to extend the wet and productive period for soils into the dry season. In the project area, the ashcap layer is variable, mainly occurring in protected concavities.

Table 148. Characteristics of landtypes for the Stonewall Vegetation Project area

Landtype	Acres	Landform	Family Classification	Topsoil Texture	Sensitive Soil Characteristics
49B	2,371	Mountain Slopes	Typic Cryoboralfs, loamy-skeletal, mixed Typic Cryochrepts, loamy-skeletal, mixed	Channery to very channery loam	Rutting and Compaction due to wet soils.
49-	2,353	Mountain Slopes	Typic Cryoboralfs, loamy-skeletal, mixed Mollic Cryoboralfs, loamy-skeletal, mixed	Cobbly loam to gravelly silt loam	--
12A	1,103	Moraines	Typic Cryoboralfs, loamy-skeletal, mixed	Stony loam	Rutting and Compaction due to wet soils.
59-	517	Mountain Ridges	Typic Cryochrepts, loamy-skeletal, mixed	Channery silt loam to very cobbly sandy loam	Rutting, compaction and erosion prone soils due to the ash-cap parent material.

[30] meaning that they consist of greater than 35 percent coarse fragments
[31] meaning they are dominated by flat fragments up to 6 inches in diameter.

Landtype	Acres	Landform	Family Classification	Topsoil Texture	Sensitive Soil Characteristics
87-	512	Glacial Trough Walls	Typic Ustochrepts, loamy-skeletal, mixed, frigid	Very channery loam	--
13A	477	Moraines or Glaciated Mountain Ridges	Typic Cryoboralfs, loamy-skeletal, mixed	Cobbly loam	Rutting and Compaction due to wet soils.
90-	458	Glacial Trough Walls	Andic Cryochrepts, loamy-skeletal, mixed Typic Cryoboralfs, loamy-skeletal, mixed	Silt loam to cobbly silt loam	Rutting, compaction and erosion prone soils due to the ash-cap parent material.
80-	236	Cirque Headwalls and Basins (Scree)	--	--	--
790	172	Glaciated Mountain Slopes	Typic Cryoborepts, loamy-skeletal, mixed Typic Cryoboralfs, loamy-skeletal, mixed	Loam	Rutting, compaction and erosion prone soils due to the ash-cap parent material.
59A	124	Mountain Ridges	Andic Cryochrepts, loamy-skeletal, mixed	Loam	Rutting, compaction and erosion prone soils due to the ash-cap parent material.
79-	119	Mountain Slopes	Typic Cryochrepts, loamy-skeletal, mixed	Channery loam	Rutting, compaction and erosion prone soils due to the ash-cap parent material.
69-	60	Mountain Ridges	Typic Cryumbrepts, loamy-skeletal, mixed	Sandy loam	--
791	50	Cirque Basins	Andic Cryochrepts, loamy-skeletal, mixed	Loam	Rutting, compaction and erosion prone soils due to the ash-cap parent material.
49A	11	Mountain Ridges	Argillic Cryobolls, loamy-skeletal, mixed	Loam	--

The project area for the Stonewall Vegetation Project has a lengthy history of land management. There are active mining claims as well as signs of past mining, grazing, and timber harvest. The flatter portions of the project area have an existing network of skid trails and roads. The area borders private land on the south and southwest, making it easily accessible for dispersed uses such as camping and firewood gathering. Effects of past management activities for the project area were determined during field surveys.

Disturbances are from old benched roads, skid trails, dozer piling, soil displacement, rutting and compaction. Current detrimental soil disturbance measurements for the units range from 0 to 3 percent (table 149). For a complete history of past management activities see appendix C.

Soil Organic Matter

Soil organic matter (SOM) is one of the most important portions of the soil resource. Soil organic matter is crucial for water holding capacity in the soil. Although the project area receives a high amount of precipitation relative to other areas in western Montana, well-drained soils tend to dry early in the season and limit vegetation growth and soil biological activity. Soil organic matter functions similarly to the ashcap soils as it holds water longer and extends the growing season. Other important physical properties of SOM include aeration, drainage, and cation exchange (Jurgensen et al. 1997).

Soil organic matter is where most of the biological activity takes place; hence the “living” portion of the soil. This portion of the soil contains most of the essential nutrients and carbon stores. Soil organic matter accumulates over decades as plant material (leaf litter and woody debris) falls to the ground and decomposes, eventually forming humus and mixing with the mineral portion of the soils (Jurgensen et al. 1997). Page-Dumroese and Jurgensen (2006) noted that soils in Idaho and Montana have much higher percentages of their nutrient capacity in the SOM of the forest floor and topsoil.

These processes have a direct effect on site productivity, sustainability, and soil quality. Organic matter is the one main component of the soil resource that can be effectively managed to enhance soil quality. Maintaining, and where lacking, increasing SOM levels is critical for sustaining forest health and productivity (Jurgensen et al. 1997). Forest floor organic material includes undecomposed litter and more decomposed duff as well as woody material in various stages of decomposition.

Table 149, contains key soil parameters identified for units during field surveys. Total average depth of organic material (litter and duff) in the project units is included in table 149. Organic material depth ranges from 1 to 7 cm, with the majority of the units (36) having less than 3 cm of organic material. Most sites have a thicker layer of litter with little duff accumulation. Duff is the more desirable organic component in the complex humic material that supports cation exchange capacity and water holding capacity. The thin organic layer in the Stonewall Project area is likely due to the cold nature of the soils and slow decomposition rate as well as removal of the litter/duff layer due to people and activities in the area.

Coarse Woody Debris[32]

Coarse woody debris (CWD) is indicative of soil quality and resiliency. Physically, CWD protects exposed mineral soil from erosion and protects seedlings from grazing (Graham et al. 1994). Coarse woody debris also provides shade and when CWD decay has advanced, it can hold large amounts of water, making it important for dry season vegetation growth (Harvey et al. 1987).

From a chemical perspective, CWD releases several nutrients when it decays or burns, including sulphur, phosphorus, and nitrogen. This is especially true during advanced stages of decay (Graham et al. 1994). Coarse woody debris functions as a site for non-symbiotic nitrogen fixation in the absence of other nitrogen fixing plants (Jurgensen et al. 1997).

[32] generally defined as any woody residue larger than 3 inches in diameter (Graham et al. 1994)

The soil biological environment is also enhanced by CWD. During advanced stages of decay, humus and woody material act as a site for the formation of ectomycorrhizal root tips. Ectomycorrhizae help woody plants take up water and nutrients and their fruiting bodies are crucial in the food chains of small rodents and predators (Graham et al. 1994).

The recommended amount of CWD for the project area is 5 to 20 tons per acre, outlined from Brown et al. (2003) and Graham et al. (1994) for maintaining soil quality while minimizing fuel hazards. Coarse woody debris amounts vary by unit in the project area. There are pockets with well over 100 tons per acre because of fallen trees killed by beetles.

In spite of the benefits of CWD to soil quality, too much can degrade soil quality to an extent. As stated earlier, coarse woody debris is a crucial source of soil nutrients and biological activity, particularly in advanced stages of decay. Therefore, when CWD begins to accumulate in the absence of fire, nutrients begin to accumulate in CWD and are no longer available for plant uptake and soil biological activity (Hart et al. 2005). This is likely the case in some of the areas with higher amounts of coarse woody debris.

Ground Cover

Ground cover percentages for Stonewall units are in table 149. Soils in the project units should have a very small percentage of ground cover in the form of bare soil. The only naturally occurring bare soil should be associated with tip-up mounds in windthrow areas or recent wildfire areas. As established above, organic ground cover (CWD and litter) is a hotbed for biological activity. Bare soil is generally much less productive and in the project area is indicative of impaired soil conditions. As displayed in table 149, there are a few units with high percentages of bare soil but most are in the 0-5 percent range. Units 14 and 15 seem anomalous with the high percentages of bare soil (36 and 32 percent, respectively). However, both of these units, along with units 12 and 13 have piles of bare soil from past mining activity.

The remaining units have mixed distributions of wood, litter, and vegetation. As established previously, soil wood and litter are important for soil quality. If, however, the balance of these components as compared to the vegetative component begins to shift, there is a condition as described above where the majority of the plant-available nutrients are “locked up” in the litter and wood component and not available for vegetation uptake and cycling back into the soil system. This is obviously the case in units 26, 35, 63, and 65 and likely the case in units 1, 17, 19, 22, 32-34, 52-54, and 59.

Soil Porosity

Soil porosity is another important indicator of soil quality and the other main property addressed in the LTSP study. Soil porosity is directly affected by soil compaction and is primarily a physical change in the soil that directly affects soil chemical and biological properties.

Soil compaction occurs as a result of applied load, vibration, and pressure from equipment used for harvest activities and site preparation. Soil compaction breaks down surface aggregates, which leads to a decrease in macropore space with an increase in micropore space and volumetrically more soil as compared to air. This creates an increased bulk density (BD) and resistance to penetration in the soil (Gomez et al. 2002). This decrease in soil macropores can impede root penetration, water infiltration, and gas and nutrient exchange (Quesnel and Curran 2000). All of this in turn has the potential to decrease tree regeneration and growth.

Another effect of increased soil bulk density and decreased water infiltration rates is the potential to alter watershed hydrology and increase soil erosion rates. This occurs primarily because decreased water infiltration causes soils to become saturated much quicker and leads to increases in overland flow, which increases erosion and runoff in a watershed. Primary skid trails and landings show the most extensive and longest lasting of these effects. Working on frozen or dry ground helps soils resist increases in bulk density. Activities on wet soils are the most damaging, as the soil aggregates are more susceptible to compaction. The three primary field measurements taken to assess levels of soil porosity changes and resiliency to compaction are detrimental disturbance, texture, and percent coarse fragments.

The Region 1 technical guide for soil detrimental disturbance analysis (USDA Forest Service 2009) states, *"…new activities would be designed so that they do not create detrimental soil disturbance (DSD) on more than 15% of an activity area (R1 Supplement to FSM 2554.03). In other words, existing DSD plus the DSD predicted for proposed activities would not exceed 15% of a given activity area. In areas where more than 15% DSD exists from prior activities, the cumulative detrimental effects should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality."* This therefore sets the threshold value for DSD at 15 percent.

Existing detrimental soil disturbance for the field-surveyed units is displayed in table 149 that follows. The presence of intensively developed sites such as previous mining activity, recreation sites, administrative sites, and permanent roads and trails are not factored into detrimental soil disturbance s (USDA Forest Service 2014). Detrimental soil disturbance was primarily associated with skid trails and landings from previous harvests.

Soils in the project area are fine-textured with high percentages of clay throughout (table 149). Although these soils also have high percentage of coarse textured sand, the clay portion can be highly compactable and sensitive to ground-based equipment, especially when wet. The percent coarse fragments column in table 149 displays a measure of rock content in the top 6 inches of mineral soil. Rock content is another indicator of the susceptibility of soil to compaction. Soils with over 35 percent coarse fragments are generally more resilient to compaction. Surveyed soils in the project area range from 13 to 70 percent coarse fragments. Only four units have less than 20 percent coarse fragments, which illustrates that most are fairly resilient. Regardless of the physical characteristics, moisture is an equally important factor in soil compaction. Dry soils are much less likely to compact than wet soils. Even soils with high rock content would compact when wet.

Table 149. Current soil dynamic properties

Unit	CWD (T/Ac)	Depth OM (cm)	Ground Cover Percentages					DSD
			Bare Soil	Rock	Wood	Litter	Vegetation	
1*	6	6	0	2	13	62	23	0
2*	--	--	--	--	--	--	--	0
3*	0	3	2	0	2	3	94	0
4	0	3	2	0	2	3	94	--
5	13	3	3	3	10	13	70	--
6	2	4	3	3	16	38	41	--
7	2	4	3	3	16	38	41	--
8	14	4	3	0	6	25	66	--
9	12	6	0	0	7	27	67	--
10	7	2	0	0	7	27	67	--
11	4	3	0	0	2	30	68	--
12	3	3	7	2	2	53	37	--
13	9	3	4	0	0	35	61	--

Unit	CWD (T/Ac)	Depth OM (cm)	Ground Cover Percentages					DSD
			Bare Soil	Rock	Wood	Litter	Vegetation	
14	0	1	36	0	0	15	49	--
15	4	2	32	13	2	42	12	--
16	--	--	--	--	--	--	--	--
17	4	4	0	0	0	62	38	--
18	0	2	0	2	0	7	92	--
19	4	3	0	0	3	73	23	--
20	12	3	0	0	0	27	73	--
21	0	2	0	0	0	12	88	--
22	13	4	3	3	13	49	31	--
23	5	5	0	0	10	17	73	--
24	7	3	3	3	7	10	77	--
25*	15	5	0	0	20	27	53	0
26	6	5	4	0	9	67	20	--
27	7	3	3	3	10	17	67	--
28	5	5	0	0	20	13	67	--
29	5	4	0	0	7	17	77	--
30	9	3	2	0	4	20	73	--
31	9	3	2	0	4	20	73	--
32	6	3	5	5	7	56	28	--
33*	10	5	0	0	16	44	39	0
34*	13	6	0	0	30	40	30	0
35*	7	7	0	0	23	63	13	0
36*	18	5	3	0	3	20	73	3
37	16	4	2	0	8	20	70	--
38	16	4	2	0	8	20	70	--
39	9	4	0	0	0	23	77	--
40	18	3	0	0	10	35	55	--
41	6	3	0	0	3	38	58	--
42	12	3	2	0	2	37	60	--
43	7	3	2	0	3	43	52	--
44	6	1	0	0	0	43	57	--
45	3	2	0	0	0	37	63	--
46*	3	3	1	0	1	27	71	0
47*	3	2	0	2	3	30	65	3
48*	0	3	2	2	0	22	75	0
49*	0	3	0	0	2	21	77	3
50	--	--	--	--	--	--	--	--
51*	0	2	2	0	0	15	83	0
52*	18	3	4	0	10	62	24	0
53*	17	7	0	0	27	40	33	0
54	10	5	0	0	16	44	39	--

Unit	CWD (T/Ac)	Depth OM (cm)	Ground Cover Percentages					DSD
			Bare Soil	Rock	Wood	Litter	Vegetation	
55	25	3	3	0	10	13	73	--
56	25	3	3	0	10	13	73	--
57	--	--	--	--	--	--	--	--
58	--	--	--	--	--	--	--	--
59	1	3	7	0	3	57	33	--
60	--	--	--	--	--	--	--	--
61	--	--	--	--	--	--	--	--
62	2	2	5	2	3	8	82	--
63	0	2	5	0	0	75	20	--
64	--	--	--	--	--	--	--	--
65	2	4	5	5	8	75	8	--
66	--	--	--	--	--	--	--	--
67	--	--	--	--	--	--	--	--
68	--	--	--	--	--	--	--	--
69	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--
71	--	--	--	--	--	--	--	--
72	0	4	0	0	0	15	85	--
73	--	--	--	--	--	--	--	--
74	42	3	6	3	26	11	54	--
75	--	--	--	--	--	--	--	--
76	--	--	--	--	--	--	--	--
77	--	--	--	--	--	--	--	--
78	--	--	--	--	--	--	--	--
79	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--
81	--	--	--	--	--	--	--	--
82	--	--	--	--	--	--	--	--
83	--	--	--	--	--	--	--	--
84	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--
86	--	--	--	--	--	--	--	--
87	--	--	--	--	--	--	--	--
88	--	--	--	--	--	--	--	--

*units with record of past activities

Summary of Current Conditions

The project area has a long management history that includes mining, grazing, and timber harvesting, which contributed to past ground disturbing activities that lead to the current conditions. The amount of detrimental soil disturbance in the units is mixed, but primarily is the result of past log landings and skid trails with the exception of four units that have residual effects from mining. The soils in the project area are generally coarse textured and resilient to compaction and erosion if operations take place during dry or frozen conditions. Ground cover is generally high in the project area and trending toward recovery where a thin organic layer exists.

Environmental Consequences

Effects Common to All Alternatives

There are no quantifiable effects common to all alternatives because soil impacts vary from no action (alternative 1), to changing prescriptions under the action alternatives within each activity area.

Alternative 1 – No Action

The Stonewall Project area is a fire-dependent ecosystem that has been subjected to fire suppression for over a century. Under natural fire regimes much of this area experienced somewhat frequent low- and mixed-severity fires, often under more favorable weather than the hot and dry conditions currently associated with wildfire starts. Such fires reduced excessive ground and ladder fuels, encouraged healthy grass and other understory vegetation, as well as the resilient ground cover they generated, and aided in recycling soil nutrients while promoting organic matter retention and buildup in the soil surface layers. Much of the cool, moist forest in the project area would have been vulnerable to occasional stand-replacing fires under natural fire regimes, but the magnitude and severity likely would have been less than that experienced today. A hypothetical no-fire scenario would be detrimental to soil health and condition due to its adverse effect on nutrient cycling and organic matter maintenance.

Under the no-action alternative, finer woody fuels (less than 3 inches diameter) and needles would accumulate on the ground in several years as a result of the mountain pine beetle (MPB) mortality. These conditions greatly increase the likelihood of a wildfire ignition. Additionally, large quantities of MPB-killed trees would fall within 10–15 years resulting in substantial accumulations of mostly large fuels (greater than 3 inches diameter). Litter cast and snags have already begun to fall throughout these areas.

As a result of heavy surface fuels in most areas of the project, if a wildfire became established it could generate very high heat per unit area and be difficult to control. Such a high-severity wildfire would directly impact soil health and site productivity. Intense, longer duration heat near the soil surface could impact microbial activity near the soil surface and result in hydrophobic conditions, increased amounts of bare soil, increased potential for surface runoff, soil detachment, large scale erosion, slower recovery of effective vegetative cover and sedimentation into water ways.

It is possible that large areas would be severely burned under wildfire conditions, far in excess of the regional soil quality standards strived for when implementing management activities. The effect would likely be more severe than a prescribed mixed-severity fire resulting in a mosaic burn pattern conducted under optimal soil moisture, ideal atmospheric temperatures, under professional supervision and at a more appropriate scale.

Cumulative Effects

The FACTS database contains records for past timber harvest activities in the Stonewall Vegetation Project Area. Harvest activities spanned several decades, with various methods of harvest occurring in the late 50s into the early 90s and burning- related activities occurring up until the early 2000s. Sanitation cuts began in 2010 to remove the roadside hazard trees that were a result of the mountain pine bark beetle epidemic. Documentation of all past harvest units within the project area can be found in the project record. All of these activities were taken into account through the unit-specific monitoring conducted in 2009. Results characterizing the existing detrimental soil disturbance from all activities are displayed in table 149.

Under alternative 1, no new management actions are proposed; therefore, no new soil effects would occur. However, past and ongoing management activities, such as previous timber harvest, roads and minerals activities would continue to affect soil resources similar to impacts described above in this analysis.

Alternative 2 – Proposed Action

Table 150. Alternative 2 - Acres of landtypes by unit within proposed unit boundaries

Unit #	Landtypes - *indicates potential for Ash Cap influence														Total Acres
	12A	13A	49-	49A	49B*	59*	59A*	69	79*	790*	791*	80-	87-	90-	
1		84	12												96
2		4	142												146
3		35	2												37
4		7	0												7
5		14	4												18
6			14												14
7		1	16												17
8		2	60												62
9			10		8										18
10		8	5		5										18
11		22			0										23
12		80													80
13		19			22										41
14		7	4												11
15		0	15												15
16		1	2												3
17		32	6												38
18		14	7												21
19		15													15
20		11	21												32
21		5	1												6
22		0	4		26										30
23			24		5										29
24					5										5
25			8		22										29
26			18		47										65
27					31										31
28			4		18										22
29			17		8										25
30			14												14
31			16												16
32			45		0										45
33					17										17

Unit #	Landtypes - *indicates potential for Ash Cap influence														Total Acres
	12A	13A	49-	49A	49B*	59*	59A*	69	79*	790*	791*	80-	87-	90-	
34					12										12
35			2		22										24
36					20										20
37					8										8
38					7										7
39			42		0										42
40					11										11
41					12										12
42					30					36					65
43	15									90					104
44			95		2										97
45			35		3										38
46	247									4					251
47	220				0										220
48	93		39											9	141
49	44		5		1										49
50	2		26		21										49
51	162		30		0										193
52					22										22
53					17										17
54					20										20
55					29										29
56					17										17
57		88	5												93
58			15												15
59					16										16
60		9			16										25
61					34										34
62			12		24										37
63					17										17
64					30										30
65					25										25
66					26										26
67					20										20
68					15										15
69			4		28										31
70		0			38										39
71			0		39										40
72	43									42					85

Unit #	Landtypes - *indicates potential for Ash Cap influence														Total Acres
	12A	13A	49-	49A	49B*	59*	59A*	69	79*	790*	791*	80-	87-	90-	
73		3	30												33
74					23										23
75	148														148
76					92	8				1			22		123
77			101		445	163									709
78		1	36												38
79		5	214	11	103	4									337
80	1		293		31										326
81	0		433		105	91									629
82					567	133	4					72			776
83					168	116	120				50			3	457
84	89		330									42	256	113	831
85	5				41									96	143
86	2		42			3									47
87		9	27		0										36
88	31		62					60	119			122	234	237	865
Total	**1103**	**477**	**2353**	**11**	**2371**	**517**	**124**	**60**	**119**	**172**	**50**	**236**	**512**	**458**	**8563**

Direct and Indirect Effects

There has been extensive research into the management impacts on ashcap soils in the intermountain west. Recommendations to reduce compaction in ashcap soils include limiting operating seasons to periods of dry soils (less than15 percent soil moisture content) or winter conditions, use of low-ground pressure machinery, and increasing spacing between trails (Page-Dumroese et al. 2007). For this project, it is recommended that the units be harvested only during dry soil or winter conditions as defined in the design criteria.

Under alternative 2, the construction of 2.6 miles of roads built then obliterated after the project would have short-term impacts on approximately 8 acres of soil. For the purpose of this analysis, soil effects from these roads will be included with the area of detrimental soil disturbance associated with tractor yarding units, because these roads would be constructed for ground-based logging equipment to access units. However, reclamation by full obliteration of these access roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on the 8 acres impacted, and would require no maintenance.

Proposed activities for the action alternatives have the potential to expose mineral soil to overland flow and subsequent erosion. Potential erosion because of project implementation was modeled using Disturbed WEPP. Inputs for WEPP modeling were extrapolated from the assumptions in the direct effects above. Specifically, it was assumed that conventional tractor harvesting would result in 12 percent decrease in ground cover, accounting for the detrimental disturbance percentage, moderate-intensity prescribed burning would have 10 percent decrease in ground cover, etc. Other WEPP inputs were gradient, slope length, soil texture, and rock percentage. These were estimated from Geographical Information Systems (GIS) data and soil mapping. All vegetation inputs were mature forest with the exception of the prescribed burning unit being low-severity fire.

Table 151 demonstrates that the probability of erosion in the first year following harvest is 3 percent for all units across all alternatives. The soil quality standards state that the tolerable soil loss rate is generally less than 1 to 2 tons per acre per year (USDA Forest Service 2014). None of the predicted erosion rates here exceeds these soil quality standards. These WEPP results do not take into account design features intended to reduce erosion potential. Therefore, it is unlikely that erosion would be an issue from either action alternative.

Table 151. WEPP modeling results for the Stonewall Project

Alternative	Unit	Drainage	Probability of Erosion[A]	Probability of Sedimentation[A]	Average erosion rate (tons/acre)[B]	30-year erosion rate (tons/acre)[C]
No action	13	Lincoln Gulch	3%	3%	0.0	0.134
Action	13	Lincoln Gulch	3%	3%	0.09	0.946
No Action	23	Lincoln Gulch	3%	3%	0.0	0.037
Action	23	Lincoln Gulch	3%	3%	0.03	0.746
No Action	84	Theodore Creek	3%	3%	0.01	0.359
Action	84	Theodore Creek	3%	3%	0.03	0.577

[A] The probability of erosion or sedimentation for the no action alternative is the probability of erosion or sedimentation in any given year. For the proposed action, it is the probability of erosion or sedimentation the first year following harvest.

[B]There is an equal probability that the erosion rate could be greater than or less than the average value.

[C]The 30-year erosion rate represents the amount of erosion anticipated if there were a 30-year rainfall following implementation.

Cumulative Effects

The appropriate geographic area for soil cumulative effects analysis has been defined as the “land area affected by a management activity” (USDA Forest Service 2014). This is because soil productivity is a site-specific attribute of the land. Forest Service Manual 2550.5 defines soil productivity as the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses. The productivity of one area of soil is not dependent on the productivity of an adjacent area of land. Similarly, if 1 acre of land receives soil impacts resulting from management activities, and a second management activity that may affect soil is planned for that same site, then soil cumulative effects are possible on that site. Thus, cumulative effects to soil productivity are appropriately evaluated on a site-specific basis.

This site-specific productive function of soil is in contrast to the integrated hydrologic function of a watershed, which is dependent on the integrity of the whole system to maintain proper function.

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field verified existing soil condition (table 152).

1. Ground based tractor harvest with broadcast or site prep prescribed fire
2. Ground based tractor harvest with jackpot or underburn prescribed fire or pile burning
3. Skyline/cable harvest with broadcast or site prep prescribed fire
4. Skyline/cable harvest with jackpot or underburn prescribed fire

5. Precommercial thin tractor with pile burning
6. Precommercial thin tractor with underburn prescribed fire
7. Precommercial thin tractor with no prescribed fire
8. Precommercial thin by hand with pile burning, underburn prescribed fire, or no burning
9. Hand treatment with low or mixed severity prescribed fire

Coarse woody debris measurements are currently below the 5 tons/acre that is recommended in regional guidelines for several units (3, 4, 6, 7, 11, 12, 14, 15, 17, 18, 19, 21, 23, 45, 46, 47, 48, 49, 51, 59, 62, 63, 65, and 72). There is potential for additional recruitment from standing dead within the units. Implementation of this action alternative would result in bringing these units into compliance with residual coarse woody debris levels.

If the proposed harvest units were to be burned by wildfire in the future following treatment, a mix of burn severities would be anticipated depending on topography, fuels and climatic conditions. Wildfire that would occur soon after treatment within the activity units may well burn with low severity, and with little detrimental soil disturbance due to the reduction of fuels, a higher amount of live residual trees and less fuel continuity (increased tree spacing).

Table 152. Projected detrimental soil disturbance for the proposed action in the Stonewall Project

Alt 2	Activity Area (acres)	Cumulative DSD without Rehabilitation		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
		Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)								
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
1	96	14.2%	22.2%	0.0%	14.2%	22.2%	12.2%	12.2%	9.1%	17.1%
2	146	2.0%		0.0%	2.0%					
3	37	14.1%		0.0%	14.1%		9.1%		9.0%	
4	7	16.6%		0.0%	16.6%		11.6%		11.5%	
5	18	16.6%		0.0%	16.6%		11.6%		11.5%	
6	14	9.0%		0.0%	9.0%		5.0%		4.0%	
7	17	9.0%		0.0%	9.0%		5.0%		4.0%	
8	62	9.0%		0.0%	9.0%		5.0%		4.0%	
9	18	16.6%		0.0%	16.6%		11.6%		11.5%	
10	18	18.3%		0.0%	18.3%		13.3%		13.2%	
11	23	18.3%		0.0%	18.3%		13.3%		13.2%	
12	80	16.6%		0.0%	16.6%		11.6%		11.5%	

Alt 2	Activity Area (acres)	Cumulative DSD without Rehabilitation		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
		Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)								
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
13	41	16.6%		0.0%	16.6%		11.6%		11.5%	
14	11	14.1%		0.0%	14.1%		9.1%		9.0%	
15	15	9.0%		0.0%	9.0%		5.0%		4.0%	
16	3	5.0%		0.0%	5.0%					
17	38	16.6%		0.0%	16.6%		11.6%		11.5%	
18	21	14.1%		0.0%	14.1%		9.1%		9.0%	
19	15	16.6%		0.0%	16.6%		11.6%		11.5%	
20	32	18.0%		0.0%	18.0%		13.0%		12.9%	
21	6	16.1%		0.0%	16.1%		11.1%		11.0%	
22	30	7.0%	15.0%	0.0%	7.0%	15.0%	5.0%	5.0%	2.0%	10.0%
23	29	9.0%		0.0%	9.0%		5.0%		4.0%	
24	5	9.0%		0.0%	9.0%		5.0%		4.0%	
25	29	7.0%	15.0%	0.0%	7.0%	15.0%	5.0%	5.0%	2.0%	10.0%
26	65	9.0%		0.0%	9.0%		5.0%		4.0%	
27	31	7.0%	15.0%	0.0%	7.0%	15.0%	5.0%	5.0%	2.0%	10.0%
28	22	17.5%		0.0%	17.5%		13.5%		12.4%	
29	25	18.5%		0.0%	18.5%		13.5%		13.4%	
30	14	10.9%		0.0%	10.9%		6.9%		5.9%	
31	16	10.9%		0.0%	10.9%		6.9%		5.9%	
32	45	17.5%		0.0%	17.5%		13.5%		12.4%	
33	17	10.0%			10.0%		5.0%		5.0%	
34	12	10.0%		0.0%	10.0%		5.0%		5.0%	
35	24	7.0%	15.0%	0.5%	7.0%	15.0%	5.0%	5.0%	2.0%	10.0%
36	20	7.0%	15.0%	0.0%	7.0%	15.0%	5.0%	5.0%	2.0%	10.0%
37	8	10.0%	18.0%	0.0%	10.0%	18.0%	8.0%	8.0%	5.0%	13.0%
38	7	13.6%	21.6%	0.0%	13.6%	21.6%	11.6%	11.6%	8.5%	16.5%
39	42	11.6%		0.0%	11.6%		6.6%		6.6%	
40	11	16.6%		0.0%	16.6%		11.6%		11.5%	

Alt 2	Activity Area (acres)	Cumulative DSD without Rehabilitation		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
		Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)								
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
41	12	10.0%		0.0%	10.0%		5.0%		5.0%	
42	65	16.6%		0.0%	16.6%		11.6%		11.5%	
43	104	16.6%		0.0%	16.6%		11.6%		11.5%	
44	97	10.6%		0.0%	10.6%		6.6%		5.6%	
45	38	17.2%		0.0%	17.2%		13.2%		12.1%	
46	251	16.6%		0.0%	16.6%		11.6%		11.5%	
47	220	19.6%		0.0%	19.6%		14.6%		14.5%	
48	141	13.1%		0.0%	13.1%		9.1%		8.0%	
49	49	16.1%		0.0%	16.1%		12.1%		11.0%	
50	49	0.0%		0.0%	0.0%					
51	193	13.1%		0.0%	13.1%		9.1%		8.0%	
52	22	7.0%	15.0%	0.0%	7.0%	15.0%	5.0%	5.0%	2.0%	10.0%
53	17	10.0%		0.0%	10.0%		5.0%		5.0%	
54	20	10.0%		0.0%	10.0%		5.0%		5.0%	
55	29	9.0%		0.0%	9.0%		5.0%		4.0%	
56	17	12.9%	20.9%	0.0%	12.9%	20.9%	10.9%	10.9%	7.9%	15.9%
57	93	16.6%		0.0%	16.6%		11.6%		11.5%	
58	15	16.6%		0.0%	16.6%		11.6%		11.5%	
59	16	9.1%		0.0%	9.1%				4.0%	
60	25	0.0%		0.0%	0.0%					
61	34	0.0%		0.0%	0.0%					
62	37	9.1%		0.0%	9.1%				4.0%	
63	17	9.1%		0.0%	9.1%				4.0%	
64	30	0.0%		0.0%	0.0%					
65	25	9.1%		0.0%	9.1%				4.0%	
66	26	0.0%		0.0%	0.0%					
67	20	0.0%		0.0%	0.0%					
68	15	0.0%		0.0%	0.0%					

Alt 2	Activity Area (acres)	Cumulative DSD without Rehabilitation		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
		Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)								
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
69	31	0.0%		0.0%	0.0%					
70	39	0.0%		0.0%	0.0%					
71	40	0.0%		0.0%	0.0%					
72	85	9.1%		0.0%	9.1%				4.0%	
73	33	0.0%		0.0%	0.0%					
74	23	13.6%	21.6%	0.0%	13.6%	21.6%	11.6%	11.6%	8.5%	16.5%
75	148	4.0%		0.0%	4.0%					
76	123	2.0%		0.0%	2.0%					
77	709		10.0%	0.0%		10.0%				
78	38	2.0%		0.0%	2.0%					
79	337		10.0%	0.0%		10.0%				
80	326		10.0%	0.0%		10.0%				
81	629		10.0%	0.0%		10.0%				
82	776		10.0%	0.0%		10.0%				
83	457		10.0%	0.0%		10.0%				
84	831		10.0%	0.0%		10.0%				
85	143	2.0%		0.0%	2.0%					
86	47		10.0%	0.0%		10.0%				
87	36		10.0%	0.0%		10.0%				
88	865		10.0%	0.0%		10.0%				

Red font indicates greater than 15% detrimental soil disturbance

Ground Based Tractor Harvest with Broadcast or Site Prep Prescribed Fire

Three units (1, 38 and 74) are proposed with this combination of treatments. All of these units would require design features to ensure compliance with Region 1 guidelines. It is unlikely that these units would meet R1 SQS if logged under summer conditions and subsequently burned. To meet Region 1 SQS Unit 15 burning would have to target the low end of burn severity under either summer or winter condition ground based harvest (table 153).

Ground Based Tractor Harvest with Jackpot or Underburn Prescribed Fire or Pile Burning

Twenty-one units (4, 5, 9, 10, 11, 12, 13, 17, 19, 20, 28, 29, 32, 40, 42, 43, 45, 46, 47, 57 and 58) are proposed with ground based harvest and jackpot or underburn prescribed fire. All of these units would require design features to ensure compliance with Region 1 guidelines. It is unlikely that these units would meet R1 SQS if logged under summer conditions and subsequently burned. To meet Region 1 SQS these units would need to be logged under winter conditions or burning deferred until post-harvest detrimental soil disturbance can be verified to ensure compliance with R1 SQS (table 153).

Skyline/Cable Harvest with Broadcast or Site Prep Prescribed Fire

Eight units (22, 25, 27, 35, 36, 37, 52, and 56) are proposed with this combination of treatments. Proposed units 22, 25, 27, 35, 36, and 52 are anticipated to comply with R1 SQS under alternative 2. Units 37 and 56 would require design features to ensure compliance with Region 1 guidelines. It is unlikely that these units would meet R1 SQS if logged under summer conditions and subsequently burned. For units 37 and 56, burning would have to target the low end of burn severity under either summer or winter condition harvest (table 153).

Skyline/Cable Harvest with Jackpot or Underburn Prescribed Fire

Seventeen units (6, 7, 8, 15, 23, 24, 26, 30, 31, 33, 34, 39, 41, 44, 53, 54, and 55) are proposed with skyline/cable harvest with jackpot or underburn prescribed fire. All these units are anticipated to comply with R1 SQS under alternative 2.

Precommercial Thin Tractor with Pile Burning

Units 3, 14, 18, and 21 are proposed with this combination of treatments and all are anticipated to comply with R1 SQS under alternative 2. Units 4, 14, and 18 are anticipated to comply with R1 SQS under alternative 2. Unit 21 would require design features to ensure compliance with Region 1 guidelines. It is unlikely that this unit would meet R1 SQS if logged under summer conditions and subsequently burned. In order to meet Region 1 SQS unit 21 would need to be logged under winter conditions or burning deferred until post-harvest detrimental soil disturbance can be verified to ensure compliance with R1 SQS (table 153).

Precommercial Thin Tractor with Underburn Prescribed Fire

Units 48, 49, and 51 are proposed with this combination of treatments. Units 48 and 51 are anticipated to comply with R1 SQS under alternative 2. It is unlikely that unit 49 would meet R1 SQS if logged under summer conditions and subsequently burned. In order to meet Region 1 SQS unit 49 would need to be logged under winter conditions or burning deferred until post-harvest detrimental soil disturbance can be verified to ensure compliance with R1 SQS (table 153).

Precommercial Thin Tractor with No Prescribed Fire

Five units (59, 62, 63, 65 and 72) are proposed with mechanical precommercial thin and no prescribed fire. All these units are anticipated to comply with R1 SQS under alternative 2.

Precommercial Thin by Hand with Pile Burning, Underburn Prescribed Fire, or No Burning

Thirteen units (16, 50, 60, 61, 64, 66, 67, 68, 69, 70, 71, 73, and 75) are proposed to be precommerically thinned by hand with one of the above burn prescriptions. All these units are anticipated to comply with R1 SQS under alternative 2.

Hand Treatment with Low or Mixed Severity Prescribed Fire

Fourteen units (2, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87 and 88) are proposed to be hand treated followed by a low or mixed severity prescribed fire. All these units are anticipated to comply with R1 SQS under alternative 2.

Table 153. Additional design criteria for selected units

Design criteria	Units
To meet Region 1 SQS burning would have to target the low end of burn severity as described in the treatment prescription.	1, 37, 38, 56, and 74
Soil disturbance in units will be evaluated following harvest activities to determine if burning after harvest, as proposed, can also be implemented and remain within Region 1 Soil Quality Standards. If it is determined that burning will exceed soil quality standards, then burn prescriptions will be adjusted so activities remain within standards. If burning prescriptions cannot be changed, then burning will be delayed until adequate soil recovery has occurred and soil quality standards are met.	4, 5, 9, 10, 11, 12, 13, 17, 19, 20, 21, 28, 29, 32, 40, 42, 43, 45, 46, 47, 49, 57 and 58

Forest Plan Consistency and Conclusions

The planned actions for the Stonewall Vegetation Project with the implementation of resource protection measures, would comply with Region 1 soil quality standards to limit detrimental soil disturbance, as well as meet Helena Forest Plan and NFMA requirements to conserve site productivity while meeting the purpose and need for this project.

Anticipated, predicted and modeled contrasts between the proposed action and no action alternative portray the importance of implementing the proposed project activities analyzed above.

This determination is based on previous monitoring of similar activities across the Helena National Forest, employing resource protection measures with monitoring proven effectiveness, and associated audits documenting that soil and water Best Management Practices are effective when implemented successfully (Montana Department of Natural Resources and Conservation 2000 and 2002; USDA Forest Service 2003).

Alternative 3

Table 154. Alternative 3 - Acres of landtypes by unit within proposed unit boundaries

Unit #	Landtypes-*indicates potential for Ash Cap influence														Total Acres
	12A	13A	49-	49A	49B*	59*	59A*	69-	79*	790*	791*	80-	87-	90-	
1		84	12												96
2		4	142												146
3		35	2												37
4		7	0												7
5		14	4												18
6			14												14
7		1	16												17
8		2	60												62
9			10		8										18
10		8	5		5										18
11		22			0										23

Unit #	Landtypes-*indicates potential for Ash Cap influence														Total Acres
	12A	13A	49-	49A	49B*	59*	59A*	69-	79*	790*	791*	80-	87-	90-	
12		80													80
13		19			22										41
14		7	4												11
15		0	15												15
16		1	2												3
17a		32	6												38
19a		15													15
20a		5	19												24
22a			4		18										22
23			24		5										29
24					5										5
25			8		22										29
27					31										31
28			4		18										22
29a			17		8										25
30a			14												14
31a			16												16
32a			45		0										45
34					12										12
35			2		22										24
36					20										20
37					8										8
38					7										7
39			26		0										26
40					11										11
41					12										12
42					30					36					65
43	15									90					104
44a			95		2										97
45a			35		3										38
46a	220									4					223
46b	27														27
47a	180				0										180
47b	9														9
47c	31														31
48	93		39											9	141
50	2		26		21										49
51	162		30		0										193
52					22										22

Unit #	Landtypes-*indicates potential for Ash Cap influence														Total Acres
	12A	13A	49-	49A	49B*	59*	59A*	69-	79*	790*	791*	80-	87-	90-	
53					17										17
57		88	5												93
58			15												15
59					16										16
61a					9										9
62			12		24										37
63					17										17
66					26										26
67					20										20
68					15										15
69			4		28										31
70		0			38										39
71			0		39										40
72	43									42					85
73		3	30												33
74					23										23
75b	20														20
78		1	36												38
79		5	214	11	103	4									337
80a	1		293		31										326
82					567	133	4					72			776
83					168	116	120				50			3	457
84	89		330									42	256	113	831
85	5				41									96	143
87		9	27		0										36
88	31		62					60	119			122	234	237	865
Total	928	443	1727	11	1494	253	124	60	119	171	50	236	490	458	6564

Direct and Indirect Effects

There has been extensive research into the management impacts on ashcap soils in the intermountain west. Recommendations to reduce compaction in ashcap soils include limiting operating season to periods of dry soils (less than 15 percent soil moisture content) or winter conditions, use of low-ground-pressure machinery, and increasing spacing between trails (Page-Dumroese et al. 2007). For this project, it is recommended that the units be harvested only during dry soil or winter conditions as defined in the design criteria.

Under alternative 3, the construction of 0.4 miles of roads built then obliterated after the project would have short-term impacts on approximately 1.3 acres of soil. For the purpose of this analysis, soil effects from these roads will be included with the area of detrimental soil disturbance associated with tractor yarding units, because these roads would be constructed for ground-based logging equipment to access units. However, reclamation by full obliteration of these access roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on the 1.3 acres impacted, and would require no maintenance.

Table 155 demonstrates that the probability of erosion in the first year following harvest is 3 percent for all units across all alternatives. The soil quality standards state that the tolerable soil loss rate is generally less than 1 to 2 tons per acre per year (USDA Forest Service 2014). None of the predicted erosion rates here exceeds these soil quality standards. These WEPP results do not take into account design features intended to reduce erosion potential. Therefore, it is unlikely that erosion would be an issue from either action alternative.

Table 155. Wepp modeling results for the Stonewall project

Alternative	Unit	Drainage	Probability of Erosion[A]	Probability of Sedimentation[A]	Average erosion rate (tons/acre)[B]	30-year erosion rate (tons/acre)[C]
No action	13	Lincoln Gulch	3%	3%	0.0	0.134
Action	13	Lincoln Gulch	3%	3%	0.09	0.946
No Action	23	Lincoln Gulch	3%	3%	0.0	0.037
Action	23	Lincoln Gulch	3%	3%	0.03	0.746
No Action	84	Theodore Creek	3%	3%	0.01	0.359
Action	84	Theodore Creek	3%	3%	0.03	0.577

[A] The probability of erosion or sedimentation for the no action alternative is the probability of erosion or sedimentation in any given year. For the proposed action, it is the probability of erosion or sedimentation the first year following harvest.

[B]There is an equal probability that the erosion rate could be greater than or less than the average value.

[C]The 30-year erosion rate represents the amount of erosion anticipated if there were a 30-year rainfall following implementation.

Cumulative Effects

The appropriate geographic area for soil cumulative effects analysis has been defined as the “land area affected by a management activity” (USDA Forest Service 2014). This is because soil productivity is a site-specific attribute of the land. Forest Service Manual 2550.5 defines soil productivity as the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses. The productivity of one area of soil is not dependent on the productivity of an adjacent area of land. Similarly, if 1 acre of land receives soil impacts resulting from management activities, and a second management activity that may affect soil is planned for that same site, soil cumulative effects are possible on that site. Thus, cumulative effects to soil productivity are appropriately evaluated on a site-specific basis.

This site-specific productive function of soil is in contrast to the integrated hydrologic function of a watershed, which is dependent on the integrity of the whole system to maintain proper function.

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field verified existing soil condition (table 156).

1. Ground based tractor harvest with broadcast or site prep prescribed fire
2. Ground based tractor harvest with jackpot or underburn prescribed fire or pile burning

3. Skyline/cable harvest with broadcast or site prep prescribed fire
4. Skyline/cable harvest with jackpot or underburn prescribed fire
5. Precommercial thin tractor with pile burning
6. Precommercial thin tractor with underburn prescribed fire
7. Precommercial thin tractor with no prescribed fire
8. Precommercial thin by hand with pile burning, underburn prescribed fire, or no burning
9. Hand treatment with low, mixed severity, jackpot, or underburn prescribed fire

Coarse woody debris measurements are currently below the 5 tons/acre that is recommended in regional guidelines for several units (3, 4, 6, 7, 11, 12, 14, 15, 17a, 19a, 23, 45a, 46a, 46b, 47a, 47b, 47c, 48, 51, 59, 62, 63, and 72). There is potential for additional recruitment from standing dead within the units. Implementation of this action alternative would result in bringing these units into compliance with residual coarse woody debris levels.

If the proposed harvest units were to be burned by wildfire in the future following treatment, a mix of burn severities would be anticipated depending on topography, fuels and climatic conditions. Wildfire that would occur soon after treatment within the activity units may well burn with low burn severity, and with little detrimental soil disturbance due to the reduction of fuels, a higher amount of live residual trees and less fuel continuity (increased tree spacing).

Table 156. Projected detrimental soil disturbance for alternative 3 in the Stonewall Project

Alt 3	Activity Area (acres)	Cumulative DSD without Rehabilitation Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
1	96	14.2%	22.2%	0.0%	14.2%	22.2%	12.2%	12.2%	9.2%	17.2%
2	146	0.0%		0.0%	0.0%					
3	37	14.1%		0.0%	14.1%				9.1%	
4	7	16.6%		0.0%	16.6%		11.6%		11.6%	
5	18	16.6%		0.0%	16.6%		11.6%		11.6%	
6	14	10.0%		0.0%	10.0%				5.0%	
7	17	10.0%		0.0%	10.0%				5.0%	
8	62	10.0%		0.0%	10.0%				5.0%	
9	18	16.6%		0.0%	16.6%		11.6%		11.6%	

Alt 3	Activity Area (acres)	Cumulative DSD without Rehabilitation Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
10	18	18.4%		0.0%	18.4%		13.4%		13.4%	
11	23	18.4%		0.0%	18.4%		13.4%		13.4%	
12	80	16.6%		0.0%	16.6%		11.6%		11.6%	
13	41	16.6%		0.0%	16.6%		11.6%		11.6%	
14	11	14.1%		0.0%	14.1%				9.1%	
15	15	10.0%		0.0%	10.0%				5.0%	
16	3	5.0%		0.0%	5.0%					
23	29	10.0%		0.0%	10.0%				5.0%	
24	5	10.0%		0.0%	10.0%				5.0%	
25	29	7.0%	15.0%	0.0%	7.0%	15.0%		5.0%	2.0%	10.0%
27	31	7.0%	15.0%	0.0%	7.0%	15.0%		5.0%	2.0%	10.0%
28	22	16.6%		0.0%	16.6%		11.6%		11.6%	
34	12	10.0%		0.0%	10.0%				5.0%	
35	24	7.0%	15.0%	0.0%	7.0%	15.0%		5.0%	2.0%	10.0%
36	20	7.0%	15.0%	0.0%	7.0%	15.0%		5.0%	2.0%	10.0%
37	8	10.0%	18.0%	0.0%	10.0%	18.0%	8.0%	8.0%	5.0%	13.0%
38	7	13.6%	21.6%	0.0%	13.6%	21.6%		11.6%		16.6%
39	26	10.0%		0.0%	10.0%				5.0%	
40	11	15.6%		0.0%	15.6%		11.6%		10.6%	
41	12	10.0%		0.0%	10.0%				5.0%	
42	65	16.6%		0.0%	16.6%		11.6%		11.6%	
43	104	16.6%		0.0%	16.6%		11.6%		11.6%	
48	141	14.1%		0.0%	14.1%				9.1%	
50	49	0.0%		0.0%	0.0%					
51	193	14.1%		0.0%	14.1%				9.1%	
52	22	7.0%	15.0%	0.0%	7.0%	15.0%		5.0%	2.0%	10.0%
53	17	10.0%		0.0%	10.0%				5.0%	

Alt 3	Activity Area (acres)	Cumulative DSD without Rehabilitation Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
57	93	16.6%		0.0%	16.6%		11.6%		11.6%	
58	15	16.6%		0.0%	16.6%		11.6%		11.6%	
59	16	9.1%		0.0%	9.1%				4.1%	
62	37	9.1%		0.0%	9.1%				4.1%	
63	17	9.1%		0.0%	9.1%				4.1%	
66	26	0.0%		0.0%	0.0%					
67	20	0.0%		0.0%	0.0%					
68	15	0.0%		0.0%	0.0%					
69	31	0.0%		0.0%	0.0%					
70	39	0.0%		0.0%	0.0%					
71	40	0.0%		0.0%	0.0%					
72	85	9.1%		0.0%	9.1%				4.1%	
73	33	0.0%		0.0%	0.0%					
74	23	13.6%	21.6%	0.0%	13.6%	21.6%		11.6%		16.6%
78	38	4.1%		0.0%	4.1%					
79	337	0.0%	10.0%	0.0%	0.0%	10.0%				
82	776	0.0%	10.0%	0.0%	0.0%	10.0%				
83	457	0.0%	10.0%	0.0%	0.0%	10.0%				
84	831	0.0%	10.0%	0.0%	0.0%	10.0%				
85	143	1.2%		0.0%	1.2%					
87	36	0.0%	10.0%	0.0%	0.0%	10.0%				
88	865	0.0%	10.0%	0.0%	0.0%	10.0%				
17a	38	5.0%		0.0%	5.0%					
19a	15	5.0%		0.0%	5.0%					
20a	24	5.0%		0.0%	5.0%					
22a	22	7.0%	15.0%	0.0%	7.0%	15.0%		5.0%	2.0%	10.0%
29a	25	5.0%		0.0%	5.0%					

Alt 3	Activity Area (acres)	Cumulative DSD without Rehabilitation Includes existing DSD, DSD from logging system, landings, burning, temp roads (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features			
Unit ID		Low Severity Burn	High Severity Burn		Low Severity Burn	High Severity Burn	Summer Logging + Deferred Low Severity Burning	Summer Logging + Deferred High Severity Burning	Winter Logging + Low Severity Burning	Winter Logging + High Severity Burning
30a	14	5.0%		0.0%	5.0%					
31a	16	5.0%		0.0%	5.0%					
32a	45	5.0%		0.0%	5.0%					
44a	97	5.0%		0.0%	5.0%					
45a	38	5.0%		0.0%	5.0%					
46a	223	5.0%		0.0%	5.0%					
46b	27	16.6%		0.0%	16.6%				11.6%	
47a	180	8.0%		0.0%	8.0%					
47b	9	19.6%		0.0%	19.6%		14.6%		14.6%	
47c	31	19.6%		0.0%	19.6%		14.6%		14.6%	
61a	9	5.0%		0.0%	5.0%					
75b	20	5.0%		0.0%	5.0%					
80a	326	5.0%		0.0%	5.0%					

Red font indicates greater than 15% detrimental soil disturbance

Ground Based Tractor Harvest with Broadcast or Site Prep Prescribed Fire

Three units (1, 38 and 74) are proposed with this combination of treatments. All of these units would require design features to ensure compliance with Region 1 guidelines. It is unlikely that these units would meet R1 SQS if logged under summer conditions and subsequently burned. To meet Region 1 SQS Unit 15 burning would have to target the low end of burn severity under either summer or winter condition ground based harvest (table 157).

Ground Based Tractor Harvest with Jackpot or Underburn Prescribed Fire or Pile Burning

Sixteen units (4, 5, 9, 10, 11, 12, 13, 28, 40, 42, 43, 46b, 47b, 47c, 57 and 58) are proposed with ground based harvest and jackpot or underburn prescribed fire. All of these units would require design features to ensure compliance with Region 1 guidelines. It is unlikely that these units would meet R1 SQS if logged under summer conditions and subsequently burned. To meet Region 1 SQS these units would need to be logged under winter conditions or burning deferred until post-harvest detrimental soil disturbance can be verified to ensure compliance with R1 SQS (table 157).

Skyline/Cable Harvest with Broadcast or Site Prep Prescribed Fire

Seven units (22a, 25, 27, 35, 36, 37, and 52) are proposed with this combination of treatments. Proposed units 22, 25, 27, 35, 36, and 52 are anticipated to comply with R1 SQS under alternative 2. Unit 37 would require design features to ensure compliance with Region 1 guidelines. It is unlikely that this unit would meet R1 SQS if logged under summer conditions and subsequently burned. For unit 37, burning would have to target the low end of burn severity under either summer or winter condition harvest (table 157).

Skyline/Cable Harvest with Jackpot or Underburn Prescribed Fire

Ten units (6, 7, 8, 15, 23, 24, 34, 39, 41, and 53) are proposed with skyline/cable harvest with jackpot or underburn prescribed fire. All these units are anticipated to comply with R1 SQS under alternative 2.

Precommercial Thin Tractor with Pile Burning

Units 3 and 14 are proposed with this combination of treatments and all are anticipated to comply with R1 SQS under alternative 2.

Precommercial Thin Tractor with Underburn Prescribed Fire

Units 48 and 51 are proposed with this combination of treatments. Units 48 and 51 are anticipated to comply with R1 SQS under alternative 2.

Precommercial Thin Tractor with No Prescribed Fire

Four units (59, 62, 63, and 72) are proposed with mechanical precommercial thin and no prescribed fire. All these units are anticipated to comply with R1 SQS under alternative 2.

Precommercial Thin by Hand with Pile Burning, Underburn Prescribed Fire, or No Burning

Eleven units (16, 50, 61a, 66, 67, 68, 69, 70, 71, 73, and 75b) are proposed to be precommerically thinned by hand with one of the above burn prescriptions. All these units are anticipated to comply with R1 SQS under alternative 2.

Hand Treatment with Low, Mixed Severity, Jackptot or Underburn Prescribed Fire

Twenty-one units (2, 17a, 19a, 20a, 29a, 30a, 31a, 32a, 44a, 45a, 46a, 47a, 78, 79, 80a, 82, 83, 84, 87 and 88) are proposed to be hand treated followed by a low or mixed severity prescribed fire. All these units are anticipated to comply with R1 SQS under alternative 2.

Table 157. Additional design criteria for selected units

Design criteria	Units
In order to meet Region 1 SQS burning would have to target the low end of burn severity as described in the treatment prescription.	1, 37, 38, and 74
Soil disturbance in units will be evaluated following harvest activities to determine if burning after harvest, as proposed, can also be implemented and remain within Region 1 Soil Quality Standards. If it is determined that burning will exceed soil quality standards, then burn prescriptions will be adjusted so activities remain within standards. If burning prescriptions cannot be changed, then burning will be delayed until adequate soil recovery has occurred and soil quality standards are met .	4, 5, 9, 10, 11, 12, 13, 28, 40, 42, 43, 46b, 47b, 47c, 57 and 58

Forest Plan Consistency and Conclusions

Alternative 3 proposed activities with the implementation of resource protection measures, would comply with Region 1 soil quality standards to limit detrimental soil disturbance, as well as meet Helena Forest Plan and NFMA requirements to conserve site productivity while meeting the purpose and need for this project.

Anticipated, predicted and modeled contrasts between the proposed action and no action alternative portray the importance of implementing the proposed project activities analyzed above.

This determination is based on previous monitoring of similar activities across the Helena National Forest, employing resource protection measures with monitoring proven effectiveness, and associated audits documenting that soil and water Best Management Practices are effective when implemented successfully (Montana Department of Natural Resources and Conservation 2000 and 2002; USDA Forest Service 2003).

Hydrology

Introduction

This section addresses potential project-related and cumulative effects on water resources—specifically, water quality and quantity in the streams within and downstream of the project area, as well as riparian area and wetland condition and function within the project area. Project streams are tributaries to the Blackfoot River.

Existing water quality concerns in the project area are mainly related to sediment delivered from roadways. Undersized culverts on roads in the project area, while not affecting current water quality, are also a concern in that culvert failure during a large flow event would likely result in the entrainment and deposition of large volumes of sediment within stream channels. Sediment is of particular concern in the project watersheds because, although the streams flowing through the project area are not listed as water-quality impaired by the State, they flow to the Blackfoot River, which has a total maximum daily load (TMDL) developed for sediment (for the section downstream of the forest boundary). In an effort to improve watershed and stream water quality conditions in conjunction with the project, extensive road maintenance to meet the State Best Management Practices (BMP) is planned for roads used for the project. In addition, the action alternatives include about 0.4 to 2.6 miles of road that would be built then obliterated immediately following timber removal. Reducing sediment delivery from roads would help meet a target set by the Montana Department of Environmental Quality (DEQ) for the Blackfoot River sediment TMDL for sediment reduction in tributary watersheds (Montana DEQ 2004).

Methodology

Sediment delivery from roads at stream crossings was predicted using an erosion/sedimentation model called WEPP Road (Elliot et al.1999). The newly developed W3 version, a physically based erosion simulation model built on the fundamentals of hydrology, plant science, hydraulics, and erosion mechanics (Laflen et al. 2004), was exclusively designed to evaluate effects of forest projects on stream flows in Region 1 of the Forest Service.

Input data used to run this model were collected in the field in the sediment surveys identified in the next section. Sediment source areas were surveyed along all roads in project watersheds. The W3 WEPP model estimated an annual average sediment delivery to project streams under existing conditions, and then model runs were done assuming surfacing and drainage improvements were implemented at road stream crossings. The physical basis and performance of the WEPP models is discussed in the model documentation (Elliot et al. 1999, 2000) as well as several peer-reviewed papers (e.g., Larsen and MacDonald 2007; Laflen et al. 2004; Elliott 2004). In general, erosion prediction models have difficulty predicting sediment output with precision from a road, hillslope, or watershed at time-scales useful to land managers. This is due mainly to a high degree of variability in site characteristics and climate. An average erosion/sediment delivery rate prediction can encompass this variability to some degree, although this value becomes much more useful when combined with a predicted probability that erosion would occur. The WEPP models incorporate climate data tailored to the individual site using PRISM data (Daly et al. 2001) and simulates daily events for a number of years specified by the user (30 years in this analysis) to determine the probability of sediment leaving the unit. The model incorporates individual precipitation event characteristics and antecedent conditions as well as site characteristics into its prediction of average annual runoff, erosion, and sediment yield values.

The culvert risk analysis was based on field measurements of the culverts within the project area and flood frequency regression curves developed for the state of Montana (Parret and Johnson 2004). Many of the streams within the project area appear to lose water to the subsurface in the downstream sections; thus the predicted flows are probably conservative for culvert flow design.

An equivalent clearcut area (ECA) analysis was completed to evaluate water yield increases due to insect mortality, wildfires, and previous forest management actions. Water yield was also evaluated using the WEPP W3 model. The model was developed to replace the Universal Soil Loss Equation (USLE) and has been widely used in the United States and the world. WEPP requires four inputs, climate, topography, soil, and management (vegetation), and provides various types of outputs including water balance (surface runoff, subsurface flow, and evapotranspiration), soil detachment and deposition at points along the slope, sediment delivery, and vegetation growth.

Water yield increases occur as a result of changes in watershed evapotranspiration, and information used in the analysis is derived from a variety of sources including the timber stand data base, which gives us a reasonable estimate of the equivalent clearcut acres. Water yield increases presented for alternative 1 (current conditions) are relative to an undisturbed, fully-forested condition[33]. The Equivalent Clearcut Area analysis was also used to estimate the impact on water yield of project activities as well as past and present activities throughout the four 6th-field watersheds in the project area (USDA Forest Service 1978, 1980). Water quantity can be an issue as excess water yield may result in accelerated stream bank erosion resulting in habitat degradation and additional sedimentation. The use of water yield and potential impacts on a stream is consistent with EPA guidance for sediment Total Maximum Daily Loads (TMDLs). State water quality standards also recommend limits on water yield and related increased flow—activities increasing mean monthly flows above 15 percent can require an Authorization to Degrade (ARM 17.30.715). Activities resulting in flow increases of less than 15 percent are considered not significant and are not required to undergo review. The indicator used in this analysis is percent annual water yield increase. In keeping with state regulations and other EPA-approved water quality habitat restoration plans and sediment TMDLs, modeled water yield benchmark for non-TMDL streams is 10 percent and for TMDL streams 8 percent is used (e.g., Montana DEQ 2004).

[33] Water yield analysis in this report uses, as a baseline, a watershed where mature forest exists and no fire or other vegetation removal has occurred in the recent past. Under natural conditions (or under conditions during which long-term flow records in the region were recorded), it is unlikely that the forests in watersheds in the study area would have been entirely intact over this interval, due to fires or insect infestations. Thus, this method of analysis is conservative—a more realistic baseline would likely consider part of a watershed to be deforested and/or recovering from disturbance at any given point in time. A natural channel would be adjusted to a marginally higher water yield than a conservative analysis would suggest.

Changes in water yield are difficult to predict at the landscape scale due to the high degree of complexity in the movement of water in mountainous forested environments. Even with exhaustive site data (i.e. transpiration rates, soil moisture and porosity, precipitation, stream flow, groundwater level and flow) available only in experimental settings, water yield estimates are approximate at best. The ECA model has been in use for several decades in the northern Rockies, and provides a reasonable estimation of the impacts of vegetation removal.

Numerous studies have been done on water yield and streamflow changes after forest harvest. In a review and summary of the short-term effects of forest harvest in the United States and other countries, Hibbert (1967) concluded that a “reduction of forest cover increased water yield,” but the “response to treatment is highly variable, and for the most part, unpredictable.” He also found that, in general, the increases in streamflow and water yield decreased over time as vegetation re-grew. In a later review, Bosch and Hewlett (1982) analyzed an additional 55 studies and concluded that increased streamflow is caused by a decrease in forest cover, and that the decrease correlated with the amount of the forest overstory canopy removed. Further, it was found that cutting conifers produced a greater increase in streamflow than cutting deciduous trees. The dense needles and branches of conifers intercept more water than hardwoods, and interception of precipitation occurs all year long. Conifers also actively photosynthesize for a longer period (Swank et al. 1988). Streamflow increases were highest in areas with greater amounts of mean annual precipitation, and were generally short lived as vegetation re-grew.

Physical riparian habitat was assessed as part of the sediment source survey described in the next section, using standard proper functioning condition (PFC) guidelines (Prichard 1998). Streams are considered to be in proper functioning condition when there is adequate vegetation, land form, or large woody debris present to dissipate stream energy associated with high water flows, filter sediment, capture bedload and aid floodplain development; improve flood-water retention and ground water recharge; develop root masses that stabilize stream banks; develop channel characteristics to provide habitat for beneficial uses; and support greater biodiversity (ibid). Streams rated as functional-at-risk are considered functional (see above), but an existing soil, water, or vegetation attribute makes them susceptible to degradation. A stream is considered nonfunctional when it is clear that there is not adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, thus leaving banks subject to accelerated erosion and worsening water quality (ibid).

Information Used

Data Sources

Sediment/Pollutant Source Survey – A sediment/pollutant source survey was completed for the project analysis. This consisted of a detailed, on-the-ground survey of the streams within the project area. Sediment and other pollutants were identified, described, photographed, and located using Global Positioning System (GPS) units. This information was entered in a database and sediment or other pollutant sources were plotted on maps of the drainages within the project area. The survey was done in an effort to assess the condition of streams within the project area as well as identify various pollution sources and causes.

Roads Sediment and Culvert Survey – A detailed roads sediment and culvert survey was also done for the project analysis. Roads within the area were surveyed in detail; sites where sediment was being transported to stream channels were evaluated and located with GPS units. Parameters measured at the sites were those required by the WEPP-Roads model. Data included road design, dimensions, gradient, surface material, buffer dimensions, and overall disturbance width and length.

Roads Analysis Process – A roads analysis was undertaken for the Helena National Forest in 2004. The analysis examined roads in maintenance levels 1 through 5. The analysis includes drainage road densities, road mileage within riparian habitat conservation areas, mileage in wet areas, mileage across erosive and slide-prone soils, mileage within TMDL watersheds, and the number of road-stream interactions. Risk ratings were given to individual roads as well as watersheds on the forest as a result of this analysis

Data Queries from the Timber Stand Database – These queries assess past harvest activities and fire acreage by 6th-field watershed in the project area. This information was used in the analysis of water yield change.

GIS layers and Queries – Numerous GIS layers were used for spatial analysis including proposed harvest units, proposed and existing roads, 6th-field watershed boundaries and streams from the national hydrography dataset (NHD), Helena National Forest (HNF) landtypes, stream buffers and various intersections of these layers with the HNF soil resource inventory. This information was used in various analyses.

Soil Survey, Helena National Forest – The HNF Soil Survey provided data on soil types and characteristics for the study area. This information was used in modeling erosion and sedimentation.

Stonedry NFMA Analysis – The Stonedry NFMA analysis looked at a variety of data including recent water quality data, roads analysis, riparian stream characteristics for reference reaches, and past harvest and fire activity.

Information from past and proposed timber harvest on private property within the project area was also used in the analysis of water yield change.

Assumptions

Water Quality

The project would meet State water quality standards for streams if all reasonable land, soil, and water conservation practices are implemented and those practices “protect present and reasonably anticipate beneficial uses.” Of the beneficial uses designated for project area streams, the proposed activities could possibly affect salmonid habitat through increased delivery of fine sediment to streams. Other beneficial uses for project-area streams are unlikely to be affected by the proposed activities.

In streams with no previously identified water quality impairment, this analysis assumes beneficial uses are being fully met and would continue to be met if project activities do not cause an increase in sediment delivery, as predicted by modeling.

The effects of each alternative are based on the following assumptions related to water quality:

- The potential for sediment delivery from forested areas is highest in the first year following disturbance, and generally recovers to pre-disturbance conditions within three to five years.
- Road improvements (new drainage features, gravel application) may result in elevated erosion shortly after installation, but would remain effective in reducing sediment delivery over a period of at least three to five years.
- Obliteration of roads may result in elevated erosion during and shortly after work, but would become stable and cease to be sediment sources within one to two years following disturbance.

- Proposed roads to be built then obliterated immediately following timber removal would not develop sediment delivery points because they would be located in upland locations without hydrologic connection to any channels.

Water Quantity

Water yield from a watershed is typically defined as the total volume of water leaving the basin via surface flow over a specified length of time. Annual water yield fluctuates based on climatic variability and changes in land use patterns.

Most hydrologic impacts occur during periods of the peak stream flow in a watershed. Stream flow is defined as “the channelized flow of water at the earth’s surface”; peak flow is defined as “the maximum flow rate that occurs within a specified period of time, usually on an annual or event basis.” In the project area, peak flows occur as the snowpack melts in the spring. Occasionally, periods of high stream flow can be caused by rainstorms.

Snow melts from a watershed in a predictable pattern. Melt begins earlier in the season at lower elevations and proceeds upslope. Snow has generally disappeared from the lower elevations some time before the spring stream flows peak. During peak flow, snow is beginning to disappear from the mid-elevations and is actively melting at the higher elevations of a watershed.

After an area has been harvested, both winter snow accumulation and spring melt rates increase. This effect is less important at lower elevations, since the snow disappears before peak flow. At mid-elevations, the additional melt may or may not be important, depending on seasonal variations. Harvesting at high elevations would have the greatest impact and is, therefore, of most concern. The changes in snow accumulation and melt brought about by forest harvesting are reduced as new forests grow. This is commonly referred to as hydrologic recovery.

Second-growth forests are said to be hydrologically recovered when snowpack conditions approximate those prior to logging and, as a result, any impact on stream flow is minimized. The most important influence of vegetation on snow accumulation is the interception of snow by the forest canopy and the subsequent loss of this snow to the atmosphere. This interception effect is a result of the combination of tree height and canopy closure. The rate at which the snowpack melts is affected by the extent to which the snowpack is exposed to solar radiation, and like interception, is also controlled by the canopy. Consequently, canopy closure is one of the main stand characteristics affecting snow accumulation and melt.

The degree of canopy closure is determined by tree species, height, and stocking density. Since tree height data is readily available and is closely correlated with canopy closure, it is the variable used to evaluate hydrologic recovery.

Forest management practices and road construction may increase water yield by removing living trees from treated areas, thus reducing the amount of water removed from the watershed by transpiration and canopy interception, evaporation, and sublimation. Excess water yield can be of concern because it may result in accelerated stream bank erosion resulting in habitat degradation and additional sedimentation. Widespread tree mortality from natural causes, such as insects, disease or fire may similarly increase water yield. Removal of trees has a greater effect on the water balance than removal of smaller plants such as grasses, forbs, and many shrubs, because large trees are generally more deeply rooted and thus have access to groundwater for a longer period of time. Trees also transpire much more water per unit area of ground coverage than smaller plants. The effects of tree removal on water yield depend on many factors, the most important of which is the percent watershed area with tree removal/mortality. A statistically significant increase in stream flow is generally not measurable until at least 20 to 30 percent of a watershed's forest cover is removed (MacDonald and Stednick 2003). Additionally, annual precipitation must generally exceed 18 to 20 inches in order for a measurable yield increase to occur even with greater forest cover removal (Bosch and Hewlett 1982; MacDonald 1987).

Many of the trees proposed for harvest under alternatives 2 and 3 would be dead or dying from insect infestation. Dead trees do not transpire and are thus not a substantial contributor to water loss in project sub-watersheds. Thus, removing these trees would have no measurable effect on the water balance in any watershed. The area of land proposed for clearing for roads to be built then obliterated immediately following timber removal is negligible at the 6th-HUC basin scale, and the majority of trees that would be removed to facilitate these roads are dead. Thus, road construction would have a minimal effect on overall water yield. Roads typically are compacted surfaces, however, that can create local flow increases that may lead to sedimentation if road drainage is connected to streams.

Road construction, however, can have a significant effect on sedimentation. The construction and maintenance of logging roads and landings exposes soil and increases the susceptibility to erosion and transport of sediment to streams (Kochenderfer et al. 1997; Swift 1985, 1988). The greatest input of sediment from roads generally occurs during construction and active log haul during timber harvest. Stream crossings, wetland crossings, and the approaches of roads to these areas are sources of the majority of sediment contribution to streams and wetlands (Swift 1988) especially where BMPs have not been properly applied (Stuart and Edwards 2006).

Physical Riparian Habitat

Proper functioning condition (PFC) is a qualitative method for assessing the condition of riparian areas (Prichard 1998). The term PFC is used to describe both the assessment process and a defined, on-the-ground condition of a riparian area. The on-the-ground condition termed PFC refers to the functional level of physical riparian processes. Proper functioning condition is a state of resiliency that allows a riparian area to maintain its integrity during high-flow events. This resiliency allows an area to produce desired values over time, such as fish habitat, neotropical bird habitat, forage, and dissipation of flood energy. Riparian areas that are not functioning properly cannot sustain these values. Proper functioning condition is used as the indicator of riparian area condition in this analysis.

Spatial and Temporal Scale of Analysis

The spatial scale of analysis of direct and indirect effects is the 6th-field hydrologic unit code (HUC). The individual 6th-field HUCs range in size from 7,552 acres for Lincoln Creek and11,617 acres for Beaver Creek, to 22,834 acres for Keep Cool Creek. This is an appropriate scale because the types of watershed impacts that are associated with forest management practices (increased sediment delivery and water yield) are generally discernible at the 6th-field HUC scale. Tools available for analysis of watershed impacts were also considered; a smaller scale of analysis would require significantly more data and effort without a commensurate increase in accuracy. The cumulative effects analysis covers the three 6th-field HUCs combined, and is approximately 42,003 acres in size. Cumulative effects from the project were considered along with other management activities and natural fires. Additionally, the mouth of the combined drainages is in the TMDL section of the Blackfoot River Headwaters, and thus is an appropriate point at which to assess cumulative effects.

The temporal bounding of the analysis for direct and indirect effects ranges from 1 to 5 years, referred to as short-term effects. Short-term increases in sediment delivery associated with construction activities (i.e. road improvements and decommissioning) would last as long as soil is disturbed or exposed in locations hydrologically connected to streams. Once the road surfaces have stabilized with aggregate or vegetation has re-established after obliteration, construction-related impacts would not be expected to persist (temporal scale of a few months to one year). After the completion of management activities on treatment units, the potential for sediment delivery is highest in the first year following disturbance and generally recovers to pre-disturbance levels within five years. Therefore, discussion of direct and indirect effects related to treatment units has a temporal scale of five years.

As used in this analysis, “long-term” effects would be expected to last greater than 5 years (e.g., physical obliteration of closed roads). Beneficial effects of application of BMPS and design features may persist longer than the short term.

Overview of Issues

Comments pertaining to disclosing the effects of project activities on hydrology were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition. Comments indicated concern that roads built then obliterated immediately following timber removal, road reconstruction, and use of existing roads would adversely impact water quality. See the Transportation section for more information about roads.

Affected Environment

Introduction

This section describes the affected environment for water resources. Much of the information presented in this analysis comes directly from field examination of the Stonewall Project area, including a stream-by-stream sediment source survey and a road sediment and culvert survey. In addition, project units that have the potential to adversely affect water quality were examined in the field. Table 158 displays watershed information used in this analysis.

Table 158. Watersheds, stream miles, and acres of watershed area

Sixth-Huc Watershed Name	Sixth-Huc Watershed Number	Stream Miles		Area (Acres)		Percent Of Watershed In Project Area
		Watershed	Project Area	Watershed	Project Area	
Beaver Creek	170102030303	34	23	11,617	8,846	76
Keep Cool Creek	170102030304	70	23	22,834	9,270	41
Lincoln Creek	170102030305	21	13	7552	5,777	77
Total		**125**	**59**	**42,003**	**25,898**	**57**

Lincoln Creek (170102030305)

The Lincoln Creek watershed is 7,552 acres in size and flows into the Blackfoot River about a mile downstream of the Forest boundary. This is a 1st-order drainage with 13 miles of streams on the Forest. Lincoln Creek appears to be a losing stream[34] near the Forest boundary. The average annual precipitation

[34] A losing stream is one that typically loses flow at the edge of the valley because the water in the stream infiltrates to ground water

is 26 inches, with approximately 35-40 inches at upper elevations, and 15-20 inches at lower elevations; the wettest months are May and June. Historic land use activities in the drainage are predominantly mining, forestry, and agriculture. Approximately 77 percent of this watershed is within the project boundary, and proposed treatment units occupy about 30 percent. There are no water quality listings in the Lincoln Creek watershed. Lincoln Creek exhibits a typical snowmelt-dominated hydrograph that can occasionally have multiple peaks during the spring due to rain events or warmer periods. The headwaters area consists of glaciated mountainous terrain while the lower portions of the watershed are comprised of mountain slopes and ridges and valley floor, all underlain by Proterozoic sedimentary rock. The stream bottoms run through compact loamy glacial till, moraines and glaciated mountain slopes in the upper portion of the watershed, and colluvial and alluvial flood plains and terraces and mountain slopes and ridges in the lower portion.

Beaver Creek (170102020303)

The Beaver Creek watershed is 11,617 acres in size and is a tributary to the Blackfoot River. The stream is connected to the Blackfoot River through a series of mostly beaver created ponds and lakes located mostly on private lands. This is a 2nd -order drainage with a mixture of 34 miles of intermittent and perennial streams. Theodore, Klondike, and Yukon Creek are mostly perennial headwater streams. Annual average precipitation for the watershed is about 31 inches from PRISM, with 35-40 inches in the upper elevations and about 15-20 inches at lower elevations. May and June are the wettest months. Beaver Creek exhibits a typical snowmelt-dominated hydrograph that can occasionally have multiple peaks during the spring due to rain events. Proterozoic sedimentary rock and Pleistocene glacial deposits underlie the Beaver Creek subwatershed. The predominant landforms are steep mountain slopes and ridges and valley floors. Historic land use activities in the drainage are predominantly mining and forestry. Approximately 76 percent of this watershed is within the project boundary, and about 17 percent is occupied by proposed treatment units. There are no streams in the Beaver Creek watershed with water-quality-limited segments (WQLS) on the Montana 303(d) list (DEQ 2008).

Keep Cool Creek (170102030304)

The Keep Cool Creek watershed is 22,834 acres in size and is a tributary to the Blackfoot River, which is located about half mile below the National Forest boundary. This second-order drainage exhibits a typical snowmelt-dominated hydrograph that can occasionally have multiple peaks during the spring due to rain events. The average annual precipitation is approximately 35-40 inches at higher elevations and 15-20 inches at lower; the wettest months are May and June. Annual average precipitation for the watershed is about 28 inches from PRISM. The drainage is characterized by steep mountainous terrain. The predominant landform is steep mountain slopes and ridges with the lower watershed consisting of alluvial flood plains and terraces. Proterozoic sedimentary rock and Pleistocene glacial deposits underlie the portion of the Keep Cool Creek 6th-HUC watershed covered by the project area. Historic land use activities in the drainage are predominantly forestry and mining. Approximately 41 percent of this watershed is within the project boundary, and proposed treatment units occupy about 16 percent. There are no water quality listings in the Keep Cool Creek watershed.

Water Quality

Project subwatersheds are in the Upper Blackfoot River Headwaters Total Maximum Daily Load planning area. The Blackfoot Headwaters TMDL for sediment was published by the Montana DEQ and cooperators in 2004. Attributes for each of the 6th-HUC watersheds covered by the project area are listed below. All of the project subwatersheds have large areas of beetle-killed trees.

Table 159. Summary of water quality impairments in project area 303(d)-listed streams

6th-Huc Watershed	Stream Segment	Listed Impairments
Blackfoot River—Little Moose Creek	Blackfoot River	Alteration in streamside vegetation, sedimentation, metals

Sedimentation

Roads Analysis Process

There are roughly 86 miles of National Forest System roads in the project area. This project includes up to 2.6 miles of roads to be built then obliterated immediately following timber removal. These proposed road segments are predominantly located in upland areas, or areas with poorly defined drainages, and would likely not pose a risk for sediment delivery to streams.

The proposed road segment number 5, accessing units 10 and 11, crosses a small drainage of a headwater tributary basin to Lincoln Creek. This apparent crossing was reviewed in the field—there is an old abandoned irrigation ditch at this site, but no stream channel or evidence of overland flow. Flow may occur in the ditch during snowmelt. If the decision is made to construct this segment, then appropriate measures (Best Management Practices) such as adequate culverts, proper road drainage, sediment fencing (if appropriate) would be applied, and the road segment would be obliterated soon after the project ends to minimize sediment impacts.

Many of the existing roads used to access the project area are known sources of sediment to streams, and were characterized as moderate-to high-risk in the HNF Roads Analysis Process. The use of these roads for project-related log hauling and other traffic would exacerbate their current sediment delivery. These roads present good opportunities for mitigation of potential sediment delivery from project activities in the form of road maintenance and improvements (e.g. gravel surfacing) and replacing undersized culverts. Mitigation measures sufficient to offset any project-related sediment delivery (from treatment units and haul routes) in the form of road BMPs and project design features have been incorporated into the project action alternatives.

Sedimentation from Roads

A detailed road sediment survey was conducted for the project area watersheds. The survey identified road segments that were hydrologically linked to stream channels and thus had the potential to deliver sediment to channels during runoff events. Road segments identified as such in the survey were modeled using the WEPP Roads model. The model’s output consists of predicted annual average sediment yield from the road prism, in terms of tons per year, based on site-specific climate data and road characteristics.

The concept of an average annual sediment load is somewhat misleading in that sediment delivery varies widely from year to year. In WEPP, the average annual value is equivalent to a two-year-return-interval flow event; there is an equal probability that the sedimentation could be greater or less than this value.

Comprehensive sediment management begins by identifying the existing primary sources of sediment and developing a strategy that preferably minimizes or eliminates sources of sediment or the erosive action in the first place. This can be accomplished by first reviewing all existing road segments posing sediment delivery risk to the stream system, planning preventive measures that reduce or eliminate road-derived sediment, and then implementing those measures. Identification of primary sediment delivery sources to streams on many roads in the Stonewall Project Area has been accomplished and they are detailed in this analysis.

The next step involves evaluating all proposed road reconstruction and roads to be built then obliterated immediately following timber removal to determine the magnitude of potential risks to the stream system. Certainly roads in valley bottoms, roads paralleling streams and within 300 feet of the stream, and roads with live stream crossings generally pose the highest risk. Recommended action can vary from eliminating the road building to relocating or modifying the road design.

The sediment mitigation for the project area requires close coordination and support from engineering and watershed specialists in reducing sediment delivery by applying various BMP standards. Sediment mitigation measures have been developed for all alternatives to reach the goal of no net increase or preferably, a reduction in sediment delivery from current levels for the proposed project. Costs associated with erosion or sediment control measures should be included in the project area plan as well as an implementation schedule. Given the magnitude of other cumulative effects that may arise from ongoing and foreseeable activities, keeping sediment delivery below existing levels may be very difficult—especially during the first 1 to 3 years as the magnitude of ground disturbance required to bring roads up to standard may in itself result in some short-term sediment delivery.

Reducing sediment delivery below current levels over the long term would likely require that some roads be brought up to BMP standards—especially roads rated as high risk to watersheds and fisheries in the Helena National Forest Roads Analysis (map locations available in GIS data files), and in the project area where sediment source surveys have identified problem areas. BMP maintenance should emphasize surfacing of the roads near stream crossings with washed gravel, improved surface drainage of roads, improved cross drainage of roads, and providing for 100-year flood flows for culvert crossings. Upgrading culverts to ensure they have the capacity to pass 100-year flows reduces risk for culvert failure and subsequent loss of road fill material to streams. Culvert crossings of perennial streams in this project area may need to be upgraded to provide for 100-year flows as well as provide for fish passage.

Sedimentation from Stream Bank Erosion

Stream bank erosion was noted in the PFC survey. Streams were surveyed in the Beaver Creek and Keep Cool Creek watersheds. Areas of accelerated erosion were located on a map, described, and photographed. There are no areas with bank alteration over the standard specified in INFISH, which requires streambanks to be 80 percent stable.

Table 160. Road information for the project area by 6th-HUC watershed

6th-Huc Watershed Name	System Roads (Mi)	System Road Density (Mi/Mi^2)	Rap* High-Risk Roads (Mi)	Rap* Moderate-Risk Roads (Mi)	Road Sediment Delivery Points	Culverts (#)	Fords (#)
Beaver Creek	33	1.8	9	16	14	13	0
Keep Cool Creek	36	1.0	2	9	24	19	2
Lincoln Creek	24	2.0	11	8	3	3	0
Total	**93**	**--**	**22**	**33**	**41**	**35**	**2**

*RAP: Helena National Forest Roads Analysis Process Report (USDA Forest Service 2004)

Sedimentation from Other Sources

In addition to accelerated stream bank erosion, other sources of sediment have been assessed in project watersheds. Other than the occasional elk wallow the only other notable sources of sediment are located downstream of Helena National Forest lands. Agriculture including cattle grazing, forestry, and mining occurs on private and State lands in project watersheds, and these activities may be a source of sediment to streams.

Stream Substrate Analysis

Sediment substrate analysis was done to determine cumulative sediment impacts in streams and to evaluate existing levels of fine sediment in stream substrates. Cumulatively, the impacts of disturbances (both natural and human related) throughout the watershed are reflected in the character of stream substrates. The percentage of fine sediment less than 6 mm diameter is used as a measure of condition. Use of sediment as a measure of risk to fisheries is appropriate for this project as it is generally accepted in watershed practice that the stream channel reflects the sum of land use activities; including natural disturbances in a watershed. Fine sediment (less than 0.25 inches diameter) levels for various streams within the project area are in table 161. Natural mean sediment levels from Helena National Forest reference cores from various drainages combined is about 32 percent with 0.66 percent (one standard deviation) of the overall range established near 10 percent each side of the mean). It is likely that reference drainages throughout the Helena National Forest may have mean sediment values of 28 to 30 percent rather than 32 percent. Specifically for streams sampled in roadless areas, sediment levels averaged 31.9 percent on the Helena National Forest. Consequently, for fisheries management goals, 32 percent likely represents a reasonable sediment level to maintain with an objective to reduce further toward the 28 to 30 percent range. As shown in table 161, several streams sampled within the project area have average sediment levels above the 32 percent level and three streams are above 40 percent.

Table 161. Summary of mean percent fines (less than 0.25 inches diameter) in select streams as an indicator of cumulative effects from past and ongoing activities by 6th-field HUC

6th Field HUC sub-watershed (name)	Stream(s) Sampled for Sediment Analysis	Mean Percent Fines in Spawning Habitat *	USEPA reference Standard (%) **	Roadless Area reference (%)
17010203 (Beaver Creek)	Beaver Creek	30.9	32.5	31.9
	Yukon Creek	34.2		
	Tributary to Yukon Creek	35.1		
	Theodore Creek	32.2		
	Klondike Creek	32.7		
17010203 (Stonewall/Park)	Stonewall Creek	31.6	32.5	31.9
	Park Creek	45.4		
17010203 (Lincoln Gulch)		Not sampled as no fishery present in most of the drainage	32.5	31.9
17010203 (Sucker/Liverpool)	Liverpool sw 1/4	42.7	32.5	31.9
	Liverpool nw ¼	25.4	32.5	31.9
	Sucker Creek	Not sampled	32.5	31.9
	Keep Cool Creek	47.2	32.5	31.9

** Reference standard developed from Helena National Forest Data in the Lake Helena Watershed

Water Yield

Past effects to the hydrology of forested areas in the project area was estimated using the equivalent clearcut area (ECA) methodology on lands managed by the Helena National Forest for existing conditions in the Lincoln Creek, Beaver Creek, and Keep Cool Creek watersheds. The current, pre-project existing condition water yield from project sub-watersheds is a result of forest clearing, past fires, insect mortality, forest roads and other activities. There are no stream gauges in project subwatersheds; as a result pre-project baseline stream flows cannot be reliably determined. Equivalent clearcut area can give a general estimate, based on the available literature, what the water yield increases from project activities may be. This estimate is based on comparable paired watershed studies completed in other parts of the intermountain west that investigated water yield effects of timber harvest and other fuels treatments.

Observed changes in the water yield after beetle kill or forest removal in snowmelt-dominated areas in the intermountain west are due to both a decrease in winter interception and a reduction in growing season soil moisture depletion (Potts 1984;Troendle 1987). In the upper part of project subwatersheds, precipitation accumulates over the winter as snow pack, with minimal melt over this accumulation period. When the snowpack begins to melt in spring, the meltwater first recharges the soil by replacing the water depleted during the previous growing season. Once soil moisture storage is filled, the excess meltwater is available to become streamflow. Paired watershed studies have shown that approximately 30 percent of the increase in water yield can be attributed to the decrease in interception and resultant increased amount of water contained in the snowpack. The reduced evapotranspiration during the previous summer also reduces the amount of meltwater needed for soil moisture recharge in the clearcut. This process accounts for approximately 50 percent of the increase in water yield. The remaining 20 percent of the observed increase in water yield results from the reduction in evapotranspiration losses during April and May (Troendle and King 1985). Primary sources of water yield increase for project subwatersheds include past timber harvest on Helena National Forest System lands and other land ownerships, as well as beetle-killed trees.

Riparian and Wetland Areas

Physical riparian habitat conditions were recorded for streams within the project area as part of the pollutant-source survey. For the most part, streams within the project area were rated to be in proper functioning condition (PFC) with the exceptions of one reach on Beaver Creek and three sites on Keep Cool Creek, which were rated functioning-at-risk. Other wetlands may exist within treatment unit boundaries, although none have been identified.

Table 162. Riparian condition and bank alteration information for the project area, by 6th-HUC watershed

6th-Huc Watershed Name	Riparian Condition*			EXCEED	Allotment(s)
	PFC	FAR	NF	BANK ALT. STANDARDS	
	(# REACHES)	(# REACHES)	(# REACHES)	(# REACHES)	
Beaver Creek	2	1		None	Stonewall
Keep Cool Creek		3		None	Keep Cool-Liverpool
Lincoln Creek	not assessed				

Not every riparian reach was surveyed in 2009—numbers should be considered minimum values.
*PFC: Properly Functioning Condition, FAR: Functioning-At-Risk, NF: Non-Functioning

Environmental Consequences

Alternative 1 – No Action

Sedimentation from Roads

Road work proposed under the action alternatives would not occur under the no-action alternative.

Table 163. Estimated average annual sediment delivery from roads to stream channels for existing condition

Watershed	Sediment Delivered for Total Road Length (Tons)
Lincoln	1
Keep Cool	6
Beaver	4
Total	**11**

Since there would be no additional disturbance to roads under alternative 1, there would be no direct short-term (less than 5 years) or long-term (greater than 5 years) detrimental sediment effects to water quality. Roads would remain in their existing conditions. Project-related road maintenance work would not occur to existing roads. There would be no sediment or water quality impacts from ground disturbing activities such as landings, tractor harvesting, road reconstruction or building, or from increased haul traffic.

Indirectly, the existing road system would continue in the short and long term to risk sediment contribution to streams, currently modeled as 11 tons per year within the project watersheds (table 163). Although old, infrequently used roads would continue to revegetate, reducing the amount of sediment produced and possibly contributed to streams; all of these old roads would continue to have varying degrees of impact to watershed hydrology and water quality. Stream channel and road fill scour, channel aggradations, and risk of sediment contribution from failure of undersized stream crossings would persist until otherwise addressed.

The no-action alternative would likely not contribute to cumulative sediment-related effects to water quality. Existing trends in water quality would likely be maintained.

No mitigation would be required under the no action alternative.

The no-action alternative is consistent with Regulatory and Forest Plan direction and would maintain existing watershed conditions

Sedimentation from Streambank Erosion and Culverts

There would be no direct long-term or short-term effects to stream channels from streambank erosion and culverts under the no action alternative.

Indirectly, the presence of undersized culverts and their continued effects on stream channel stability at and near stream crossings would continue to be a resource concern. Undersized culverts are a long-term risk for sedimentation due to the possibility of failure. There are no conflicts with plans or policies with this alternative and no mitigation would be necessary. This alternative would meet Forest Plan and Regulatory guidance related to stream channels.

Sedimentation from Other Sources

There are several documented small sediment sources in the pollutant source survey, but these sites were determined to be minor sources of sediment to channels. There are no recent burns or other large-scale disturbances identified as sediment sources in the project area.

There is no vegetation manipulation proposed in the Stonewall Project area under alternative 1; consequently, there would be no water yield increase over watershed baseline as a result of this alternative.

Water Yield

Methods for determining the effects of vegetation removal on water yield have been developed for the Helena National Forest (Pfankuch 1973), and reviewed, and refined for USDA Forest Service Region 1. The methods developed were for areas with snowmelt-dominated runoff. The equivalent clear-cut area (ECA) model is a key component of these methods. The basis of the ECA analysis is that water yield increases when vegetation is removed, whether by natural disturbance such as fire, or by human disturbance. The project area harvest history was used to determine the existing, baseline ECA and runoff values on Forest Service lands in the project area by watershed. The GIS database for the Helena National Forest was queried to obtain all records of documented timber harvest. USGS HUC 6 watersheds were used to delineate the tributary watersheds.

The model was then re-run to estimate forest canopy and run-off changes after the proposed treatments are completed (see alternatives 2 and 3).

Table 164. Existing condition equivalent clearcut area (ECA) due to past alterations in vegetation cover in the project area

Watershed	Existing Equivalent Clearcut Area
Lincoln Creek	
Percent of Drainage Harvested:	16
Percent of Past Harvest Recovered:	31
Percent of Drainage as ECA:	7
Beaver Creek	
Percent of Drainage Harvested:	15
Percent of Past Harvest Recovered:	19
Percent of Drainage as ECA:	4
Keep Cool Creek	
Percent of Drainage Harvested:	13
Percent of Past Harvest Recovered:	28
Percent of Drainage as ECA:	3

Peer-reviewed research has suggested that in areas such as the project area, roughly 20 to 30 percent of a watershed must be treated in order to begin to attain a statistically significant increase in streamflow (MacDonald and Stednick 2003). The percent area in ECA in the Lincoln Creek drainage under current conditions is about 7 percent, and Beaver Creek and Keep Cool Creek watersheds are 4 and 3 percent respectively. Minor streamflow increases may have occurred under existing conditions within the project area watersheds. However, in drier mountains such as the project area, research has suggested that streamflow increases are reduced in that remaining trees after treatment tend to make use of most additional water made available through the reduction in transpiration brought about by tree removal (MacDonald 1987). This same concept applies to both action alternatives to some degree, especially for thinning and salvage harvest of dead trees. Clearcut harvest may have the largest potential water yield increases.

Acres of vegetation removal from timber harvest, roads and fire are converted to ECAs to provide a common datum to compare activities based on the amount of cleared area. ECAs are calculated by summing the appropriate acreage, evaluating the percentage of crown removal then assigning a hydrologic recovery value based on stand age. National Forest System roads are not recovered hydrologically and therefore are assigned a recovery value of zero. For timber harvest there is a continuum of recovery values as the stand ages.

Water yield increase is greatest immediately following vegetation removal. In years subsequent to vegetation removal, the ECA (and water yield increase) declines, or “recovers” because of vegetation regrowth. The rate of regrowth and thus ECA recovery is based on evapotranspiration, snowfall accumulation related to patch dynamics, and the relationship between water yield and changes in vegetation interception. This regrowth relationship is expressed as a recovery curve.

There are limitations of ECA and water yield analysis. Removal of existing vegetation may demonstrate increases in water yield over existing conditions, however the ECA method does not account for the fact that fire suppression has resulted in overstocked forest conditions that may have actually been reducing water yield below “normal” levels. ECA analysis assumes that stands prior to harvest are fully stocked when in reality some stands at historic conditions were not fully stocked. In addition, this analysis does not accurately account for effects of vegetation removal on other land ownerships, which is a known activity, and it does not weight estimates based on elevation and aspect, which are known to influence water yield. ECA analysis is a relative index of change that might occur, not an absolute result. It is used in combination with other information to determine the effects that the proposed activities may have.

Another method used to estimate flow increases is the W3 module of the Water Erosion Prediction Project (WEPP) Model (Laflen 2004). The W3 module is designed to specifically estimate surface water yield from a project. It evaluates drainage and precipitation patterns, and the interactions with watershed soils. The model does not accurately predict flow increases due to groundwater inputs. It is difficult to predict the water yield from water that infiltrates deeply into bedrock layers, which are tied more to groundwater yield. As a result, flow and water yield estimates are focused on surface flow increases

Water yield increase values provided in this analysis are modeled approximations for the increase in runoff volume from vegetation removal. These values do not account for the effect the road system has on routing water and changes to the hydrograph. Although we did not model water yield impacts from roads, research has shown that roads can influence peak flows (Wemple and Jones 2003).

Riparian and Wetland Areas

The effects on physical riparian condition for the no action alternative would be similar to what is depicted in the affected environment. For the most part, streams within the project area were rated to be in proper functioning condition (PFC) with the exceptions of one reach on Beaver Creek and three sites on Keep Cool Creek, which were rated functioning-at-risk. No wetlands have been identified within the project boundaries.

Irreversible and Irretrievable Commitments

An irretrievable commitment represents a temporary loss of a resource that can be replaced over time. An irreversible commitment represents a total loss of a resource that cannot be replaced. An irretrievable commitment under the no action alternative would be continued erosion and sediment delivery from project area roads at existing levels, in the absence of road improvement work of the type specified in this project.

Cumulative Effects

Several past and present Federal and other ownership activities have affected and would continue to affect water quality, water yield, and riparian health and vigor in the cumulative effects analysis area for the foreseeable future. Federal and private roads and culverts constructed at road/stream crossings in the project area have affected streams and riparian areas. There are several sediment delivery points on existing roads as described previously, and culverts represent a permanent grade control in the stream channels where they reside. These existing roads also have several road/stream crossings. Culverts at road/stream crossings in the project area watersheds were analyzed for this analysis. Undersized culverts can affect the stream’s ability to convey water and sediment, and represent an increased risk of failure and subsequent erosion and deposition of sediment into stream channels. Culverts directly interact with channels and can affect channel morphology and channel migration patterns, and local hydraulics that may influence the stream channel.

There has been past timber harvest activity in the analysis area. Land disturbed by prescribed burn and harvest activities with effective BMP application typically recovers within 5 years, based on observations of similar projects in the region. Dead trees cover a considerable area in the project area. Younger understory trees released by overstory tree mortality would eventually after a couple decades create a forest canopy and reduce evapotranspiration.

Continued grazing in riparian areas and cattle trailing along streams within grazing allotments would likely continue to contribute elevated sediment levels to streams in the watershed; although, adaptive management provisions in allotment management plans should be implemented where necessary to reduce livestock impacts. In the absence of other non-project related activities designed to reduce sediment delivery in the watershed, streams in several of the watersheds where treatment is planned would continue to receive sediment from anthropogenic sources near current rates.

In the past, mining has contributed sediment to stream channels in the watersheds. Additionally, abandoned mines can pose chronic or episodic water quality problems to forest streams.

The Stonewall project-area watersheds may be affected by large-scale tree mortality due to insect infestations. Large-scale loss of live trees may affect water yield by reducing the volume of water removed from a watershed by transpiration.

In addition, extensive tree mortality could remove the shade available and increase stream temperature in streams that cross the impacted stands. However, understory vegetation, generally unaffected by insect mortality, would continue to provide shade. Furthermore, understory and riparian vegetation exposed to increased levels of sunlight and moisture (due to overstory mortality or tree removal) can expand and provide additional shade (Gravelle and Link 2007). While an increase in incoming short-wave (solar) radiation is generally considered to be the dominant driver of stream temperature increase, numerous factors influence the extent to which a stream exposed to additional direct sunlight would have an increase in water temperature (Johnson 2004). Thus, the extent of water temperature changes resulting from overstory mortality is difficult to predict.

Alternatives 2 and 3

Alternative 2 treats 8,564 acres within the project area, and alternative 3 treats 6,564 acres. Treatment consists of a mixture of regeneration harvest, commercial thinning, non-commercial thinning, and low and mixed severity prescribed burns.

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to hydrology and other resources is displayed in table 9, chapter 2.

The specific design features listed under soil, watersheds and fisheries in table 9 pertaining to hydrology are S/WS/F-18 through S/WS/F-26.

This analysis is based on the implementation of all design features. Project design features apply to all action alternatives. Design features that are applicable to hydrology include not only those listed above, designed specifically to protect water quality and water quantity, but also those designed to protect other resources.

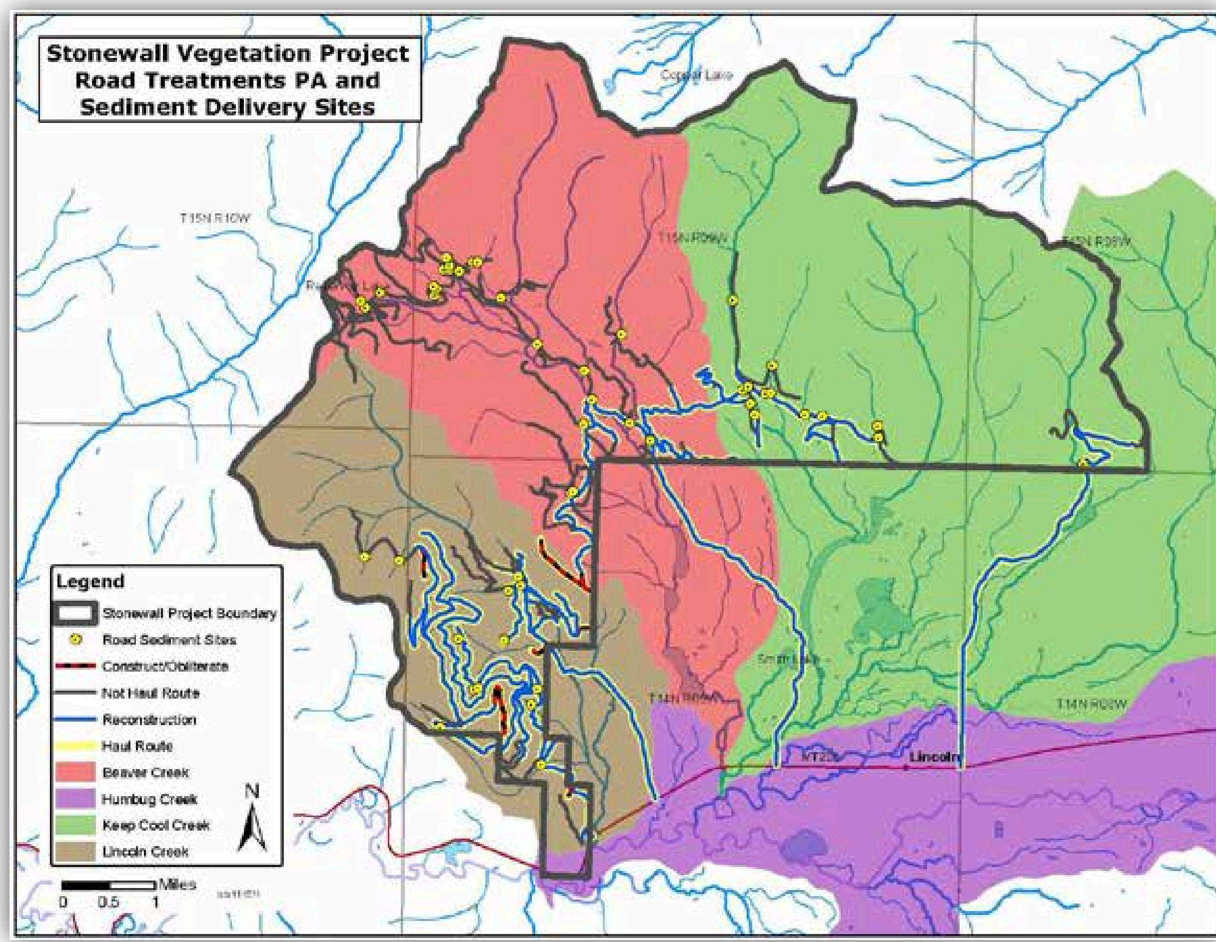


Figure 113. Sediment source areas and proposed road treatments for alternative 2- project watersheds

Effects Common to All Action Alternatives

Road maintenance and improvement best management practices (BMPs) would be applied to all roads used in the project, including application of aggregate at road/stream crossings and other sediment delivery points.

Sedimentation from Roads

WEPP Road models sediment delivery to streams mainly at road/stream crossings, often located at culvert crossings or bridges. Water concentrated on the road surface often flows down the road surface toward the low side of stream crossings, flows down the fill slope, and may enter the stream carrying sediment eroded from the road surface or fill slope. The model determines the amount of runoff that may occur from a road surface adjacent to a channel.

There should be a short-term (up to 5 years) reduction in sediment transport from roads in the project area resulting from road improvements planned in both alternatives (table 165). Forty-eight miles of road used for alternative 2 and 44 miles of road under alternative 3 would receive BMP maintenance. Project-related road improvements include surface grading, re-establishment of drainage features (grade dips and ditch-relief culverts), and application of sorted gravel at stream crossings and other sediment delivery points.

Table 165. Road obliteration and maintenance for project

Action Alternative	Roads Built For Project Use Then Obliterated (Miles)	Road Maintenance (Miles)	Total (Miles)
Alternative 2	2.6	45.6	48.2
Alternative 3	0.4	43.8	44.2

Table 166. Estimated average annual sediment delivery from roads to stream channels by sub-drainage for existing conditions and alternatives 2 and 3

Watershed	Sediment Delivered For Total Road Length (Tons)	Alternative 2&3 Sediment Delivered For Total Road Length	Project Road Sediment After Bmps Maintenance
Lincoln	1	2	1
Keep Cool	6	18	5
Beaver	4	11	3
Total	**11**	**31**	**9**

There are about 2.6 miles of roads that would be built then obliterated immediately following timber removal (new and “new specified”) planned in these alternatives. These proposed road segments are predominantly located in upland areas or areas with poorly defined drainages, and would not likely pose a risk for sediment delivery to streams. The new roads would be obliterated immediately following timber removal. See the transportation report for more information regarding roads (Bielecki 2012).

The proposed new road segment number 1 (see project area map) crosses the drainage of a headwater tributary basin to Lincoln Creek. This apparent crossing was reviewed in the field—there is a vegetated old roadbed at this site, but no stream channel or evidence of overland flow. Channel features were observed roughly 60 feet below the roadbed. Sediment that appeared to be from the old roadbed was observed in this channel, indicating that in the past, this road probably contributed sediment to the uppermost reach of this intermittent stream. If restored, this road represents a potential source of sediment to the stream channel, and should be accounted for in estimates of sediment impacts of the project. If the decision is made to construct this segment, then appropriate measures (Best Management Practices) such as adequate culverts, proper road drainage, sediment fencing (if appropriate) would be applied, and the road segment should be obliterated soon after the project ends to minimize sediment impacts.

The proposed new road segment number 5 crosses a small drainage of a headwater tributary basin to Lincoln Creek. This apparent crossing was reviewed in the field—there is an old abandoned irrigation ditch at this site, but no stream channel or evidence of overland flow. Flow may occur in the ditch during snowmelt. If the decision is made to construct this segment, then appropriate mitigations must be in place (adequate culvert, proper road drainage, and sediment fencing if appropriate) and the segment should be obliterated soon after the project ends, to minimize sediment impacts.

Many of the existing roads used to access the project area are known sources of sediment to streams, and were characterized as moderate-to high-risk in the Helena National Forest Roads Analysis Process (USDA Forest Service 2004). Project-related log hauling and other traffic would exacerbate sediment delivery: therefore, these roads present good opportunities for mitigation of potential sediment delivery from project activities, in the form of road improvements (e.g., gravel surfacing) and replacing undersized culverts.

All required State and Federal permits (e.g., SPA 124, CWA 402/404) would be obtained prior to construction of this new road.

The total reduction in average annual sediment transport from using BMPs for project haul roads was modeled to be roughly 2 tons less than the existing conditions under this alternative, based on proposed BMP maintenance and road improvements. For the road segments to be obliterated, the reduction in sediment delivery would be permanent. Without repeated maintenance, conditions on open roads would likely trend toward pre-project conditions over the next several years once the project is complete.

Sedimentation from Streambank Erosion and Culverts

Proper functioning condition surveys did not identify any areas of unstable stream banks in project watersheds. Unstable stream banks may exist in project watersheds. Where these features exist, sedimentation from accelerated stream bank erosion would continue to occur under these alternatives. Inadequately sized culverts may have a potential for increasing stream sedimentation. Some stream crossing culverts are undersized, and have the potential for removal during large flood events.

Sedimentation from Other Sources

The probability and volume of sediment delivered to stream channels from treatment units was estimated using the Disturbed WEPP model in project alternatives. Sedimentation and delivery of sediment probability reflects the variability in slope, soil type, and treatment type among units. The estimated sediment yield and probability are for the first year following treatment, and would likely return to pre-project (near zero) values within 5 years. See the soils report for more information on sediment sources in project units (Farr 2015).

Water Yield

The project-related and cumulative equivalent clearcut areas and estimated percent water yield increase that would result from proposed activities under the action alternatives are listed in table 167, and table 168. On other drainages within the Helena National Forest the State DEQ has suggested water yield thresholds of concern of 8 percent for TMDL streams and 10 percent for non-TMDL streams (Blackfoot Headwaters Planning Area: Water Quality and Habitat Restoration Plan and TMDL for Sediment, 2003).

Table 167. Equivalent clearcut area (ECA) by alternative

Huc 6 Watershed	Equivalent Clearcut Area		
	Existing	Alternative 2	Alternative 3
Lincoln Creek			
Percent of Drainage Harvested:	16	42	32
Percent of Past Harvest Recovered:	31	12	16
Percent of Drainage as ECA:	7	14	11
Beaver Creek			
Percent of Drainage Harvested:	15	29	25
Percent of Past Harvest Recovered:	19	10	11
Percent of Drainage as ECA:	4	5	5
Keep Cool Creek			
Percent of Drainage Harvested:	13	20	18
Percent of Past Harvest Recovered:	28	18	21
Percent of Drainage as ECA:	3	4	3

Table 168. Estimated percent water yield increase by action alternatives

Watershed	Percent Water Yield Increases	
	Alternative 2	Alternative 3
Lincoln Creek	4.9	3.85
Beaver Creek	1.75	1.75
Keep Cool Creek	1.40	1.05
Overall for Project Watersheds	2.13	1.75

This equivalent clearcut area analysis considered all past harvest and watershed disturbances, and the effects of reduction in forest canopy. Table 167 shows that for the proposed action, alternative 2, ECA values range from 4 percent in Keep Cool watershed, to 14 percent in the Lincoln Creek watershed. For alternative 2, for all project watersheds 23 percent of the project watersheds are in equivalent clearcut condition. For alternative 3, 19 percent of project watersheds would be in equivalent clearcut condition. In areas such as the Stonewall Project area, 20 to 30 percent of a watershed must be treated in order to begin to realize a statistically significant measureable increase in streamflow (MacDonald and Stednick 2003). Furthermore, in drier mountains such as the analysis area, research has suggested that remaining trees tend to make use of additional water made available through the reduction in transpiration brought about by tree removal (MacDonald and Stednick 2003), reducing the likelihood that predicted yield increases would be detectable in any of the study basins.

Given the number of acres that would be treated in the project watersheds under alternative 2 or 3, it is unlikely there would be a cumulative increase in water yield that would be detectable. The estimated water yield increase for project watersheds is below the DEQ-recommended threshold of 10 percent, and below the 15 percent stipulated in ARM 17.30.715. Streams emanating from project watersheds appear to lose flow as they move from steeper areas and encounter deep valley floor sediments. Considering the dry (losing stream) nature of the channels in the Stonewall Project area watersheds, the potential increase in water yield would be unlikely to cause any negative effects (i.e. accelerated bank erosion). In the event of an actual increase in water yield, the trout population could benefit from greater water availability.

Table 169. Percent estimated cumulative water yield increase over baseline conditions (%)

6th-Huc Watershed	Percent Cumulative Water Yield Increase Over Baseline		
	Alternative 1	Alternative 2	Alternative 3
Lincoln Creek	0	4.9	3.8
Beaver Creek	0	1.8	1.8
Keep Cool Creek	0	1.4	1.0

The equivalent clearcut area (ECA) method was used to calculate potential water yield increase given cumulative impacts in the Lincoln, Beaver Creek, and Keep Cool Creek watersheds. Table 169 shows that results for the action alternatives suggests an increase of 4 to 5 percent in the Lincoln watershed, about 2 percent in the Beaver Creek watershed, and 1 to 1.5 percent in the Keep Cool Creek watershed, depending on alternative. The project, when combined with other recent, past and reasonably foreseeable actions was predicted to result in a theoretical combined increase in water yield from project watersheds of 2.1 percent at the confluence with the Blackfoot River. Given the dry/losing character of the stream channels in the project area, any change in water yield as a result of the project would be difficult to detect, particularly considering that the majority of the ECA is from past or existing land use activities. Recent stream flow records at the nearby Helena National Forest Deep Creek monitoring site have not shown clear evidence of higher stream flow under the existing conditions. The small incremental potential increase posed by this project would likely not measurably change flow conditions. However, if a water yield increase were detectable, it would almost certainly be within acceptable limits for TMDL streams. In other drainages within the Helena National Forest, the State DEQ has suggested water yield thresholds of 8 percent for TMDL streams and 10 percent for non-TMDL streams (Montana DEQ 2004).

The W3 module of the Water Erosion Prediction Project (WEPP) Model was used to estimate unit discharges for different treatment types for the project. Results provide a rough estimate of potential flow increases. The model evaluates drainage and precipitation patterns, and the interactions with watershed soils. The model does not accurately predict flow increases due to groundwater inputs. It is difficult to predict the water yield from water that infiltrates deeply into bedrock layers that are tied more to groundwater yield. As a result, flow and water yield estimates are focused on surface flow increases. These estimates are based on the hydrology of headwater areas in each of the project watersheds, and are likely less than what was calculated in the model. None of these results exceeds Forest Plan standards.

Table 170. WEPP W3 module predicted flow increases for the project area

Watershed	Runoff (Acre-Feet/Year)			
	Alternative 2	Alternative 3	Average Annual Surface Runoff	Percent Runoff From Project
Lincoln Creek	1,611	1,255	15,844	8
Beaver Creek	2,175	569	24,372	2
Keep Cool Creek	2,191	1,793	47,906	4

Riparian and Wetland Areas

For both action alternatives, riparian areas would have at least a 50-foot no-ignition buffer around ephemeral, intermittent, and perennial channels for slopes less than 35 percent, and a 100-foot buffer for slopes more than 35 percent. Additionally, the standard SMZ-law protection prohibits the operation of ground-disturbing equipment within riparian areas. Therefore, activities proposed under these alternatives would not adversely affect riparian areas. Streams within the project area would generally remain at proper functioning condition. The notable exceptions would be the functional-at-risk stream segments. These stream segments are expected to remain in that condition under this alternative.

No wetlands have been identified within the project area boundaries. If wetlands are identified during unit marking, they would be avoided by heavy equipment unless during winter conditions. Wetlands over one acre connected to stream channels would be protected by a no-harvest SMZ buffer. As noted above there would likely be small increases in water yield in project-area streams under this alternative. However, these minor changes are not expected to change the PFC ratings for any of the streams within the Stonewall Project area.

Irreversible/Irretrievable Commitments

An irretrievable commitment represents a temporary loss of a resource that can be replaced over time. An irreversible commitment represents a total loss of a resource that cannot be replaced. Any sediment delivery to streams resulting from implementation of this project would be an irretrievable commitment, in that the stream would recover from the influx of additional sediment over a period of years to decades. However, if all appropriate harvest and road BMPs are carefully and consistently applied, it is unlikely that any irretrievable commitments would result from project implementation (Montana DNRC 2008).

Furthermore, reductions in sediment delivery due to project road improvements were estimated to exceed the potential sediment delivery related to project activities.

Cumulative Effects

Past, present and reasonably foreseeable Federal and other ownership actions within the analysis area are described previously in the section for alternative 1, and can be found in volume 2, appendix C. These impacts include mining, wildfires, timber harvest, and recreation. The cumulative impact of alternatives 2 and 3 in concert with other impacts in the analysis area would be a net reduction in short-term and long-term sediment delivery to stream channels. The short-term reductions would come from road surfacing and drainage improvements. Long-term reductions would result from road obliteration. These reductions in sediment delivery would more than offset the low-probability of the predicted short-term increase from treatment unit erosion, as well as any sediment delivery associated with road improvements and obliteration.

Conclusions

The proposed project identifies two action alternatives. Alternative 2 treats 8,564 acres, and alternative 3 treats 6,564 acres with a range of harvest and burning prescriptions. Primary water resource concerns stemming from this project include potential sediment conveyance to streams from project treatment units, and potential increased water yield due to removal of vegetation. Field sediment surveys identified road segments that were capable of delivering sediment to ephemeral, intermittent, or perennial stream channels. The WEPP:Road model was used to predict the average annual sediment conveyance for each road segment, as well as the probability that sediment would be delivered from the road segment in a given year. The model was run for existing conditions as well as conditions under each action alternative. Under all project alternatives, overall reductions in sediment delivery to stream channels due to application of road BMPs and road obliteration are expected. Results suggest that under existing conditions, roughly 11 tons of sediment is delivered from roads to Lincoln, Beaver, and Keep Cool Creeks in an average year (table 166). With design features proposed in this project, sediment delivery from roads would remain one ton per year for Lincoln Creek, reduced by about one ton each for Beaver and Keep Cool Creeks. Overall sediment delivery reduction for alternatives 2 and 3 during the project is estimated to be about 2 tons. While road improvement and road obliteration activities may temporarily increase sediment delivery to stream channels, the design features proposed in this project would reduce sediment delivery to project area tributaries of the Blackfoot River over the long term (alternatives 2 and 3), leading to improved conditions in project watersheds.

The project has the potential to increase water yield in Lincoln Creek, Beaver Creek, and Keep Cool Creek. A water yield increase above 10 to 15 percent may be of concern in that the flow increase could accelerate bank erosion. Water yield increase is less likely to be an issue in the project area due in part to lower annual precipitation levels, to the dry/losing character of the streams in these watersheds, and to the relatively small footprint of the project. The Equivalent Clearcut Area (ECA) and the WEPP W3 method was used to calculate potential water yield increase given cumulative impacts in the Lincoln, Beaver Creek, and Keep Cool Creek watersheds. Results suggested an increase of up to 8 percent in the Lincoln watershed, 2 percent in the Beaver Creek watershed, and up to 4 percent in the Keep Cool Creek watershed, depending on alternative (table 169 and table 170) and analysis method. The project, when combined with other recent past and reasonably foreseeable actions was predicted to result in a theoretical combined increase in water yield from project watersheds of about 5 percent at the confluence with the Blackfoot River. These levels are within State DEQ recommendations for TMDL and non-TMDL streams elsewhere on the Helena NF. If predicted water yield increases did occur, the modest additional flow would likely improve stream temperature and in-stream physical habitat, rather than cause any degradation. The project is unlikely to significantly affect the condition of riparian areas in the project area, given the 50- to 100-foot riparian no-ignition buffers in place for all action alternatives. The project is unlikely to affect the condition of any wetlands found in the project area, in that these areas would either be avoided entirely, or would be treated only by hand crews or by equipment during winter operating conditions.

In summary, the proposed project would have relatively minor impacts to water resources in the project watersheds under the action alternatives. Through implementation of design features and application of BMPs, the project alternatives would most likely reduce short- and long-term sediment delivery to stream channels, improving or maintaining water quality in the Blackfoot River headwaters watershed. Alternatives 2 and 3 would also reduce long-term sediment delivery through improving road BMPs at stream crossings. Water yield change due to proposed project activities is predicted to be at the margins of detectability and is not anticipated to have any deleterious effects on channel stability or water quality

Fisheries

Introduction

This section documents existing condition and environmental consequences to aquatic resources from the proposed Stonewall Vegetation Project, and also discusses the potential effects to Forest Service sensitive, management indicator species (MIS), and Endangered Species Act (ESA) listed aquatic species westslope cutthroat trout (*Oncorhynchus clarki lewsi*), bull trout (*Salvelinus confluentus*), and western pearlshell mussel *(Margaritifera falcata).*

Table 171. Analysis area species

Species	Species Status	Present In Project Area: Habitat Or Detections
Fishes		
westslope cutthroat trout (*Oncorhynchus clarki lewsi*)	USFS Sensitive	Yes Habitat and Detections
bull trout (*Salvelinus confluentus*)	ESA Threatened	Yes
Invertebrates		
western pearlshell mussel *(Margaritifera falcata)*	USFS Sensitive	No Detections but predicted habitat

Overview of Issues

Comments pertaining to disclosing the effects of project activities on fisheries were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition. Comments indicated concern that roads built then obliterated immediately following timber removal, road reconstruction, and use of existing roads would adversely impact fisheries. See the Transportation section for more information about roads.

Indicators

Indicators are defined to analyze data regarding the potential for increases to sediment delivery and changes to the timing of peak flows from project activities that may affect cutthroat trout habitat.

Change in stream habitat conditions for westslope cutthroat trout (MIS), bull trout and other aquatic species

1. Changes in stream function
    a. Change in sediment delivery to streams
    b. Change in fines by depth
    c. Change in the timing or increases in the magnitude of stream flows

Change in characteristics of riparian areas

1. Change in miles of motorized routes in RCAs
2. Acres of riparian treatments

Affected Environment

Introduction

This section presents existing conditions and trends for aquatic resources within the Stonewall Vegetation Project planning area. Information is organized under two major subsections: ***fish populations*** and ***fish habitat***. The first discusses the status and distribution of fish populations inhabiting the planning area; this includes discussions about nonnative and native fish populations. The second subsection provides an overview of fish habitat including land-use activities that influence trends in stream habitat conditions.

Analysis Area

The Stonewall Project area encompasses three sub-watersheds (tributaries) of the Blackfoot River watershed. Natural processes and land-use activities unique to each sub-watershed influence local fish populations and their habitats independently of other watershed units of the same scale. The geographic area of preference is the watershed scale delineated at the 6th field hydrologic unit code (HUC), namely Lincoln Gulch, Beaver Creek, and Keep Cool Creek. These boundaries are appropriate for addressing direct, indirect and cumulative effects upon fish populations occurring within each of these 6th field HUCs (sub-watersheds). The cumulative effects area, however, extends to mainstem Blackfoot River because it receives waters from the project planning area.

Existing Condition

Salmonid fishes present within the project area include westslope cutthroat trout, bull trout, brown trout, brook trout and mountain whitefish. Other fish species present include sculpins and suckers. Historically, most project area perennial streams suitable to support a fishery were likely occupied by various native fish. The introduction of nonnative salmonids, including brook, brown and rainbow trout, within portions of the Blackfoot River drainage, has changed the fish species composition somewhat in the project area. The current salmonid fish species composition within the project area is summarized by streams in table 172 that follows. The upper limits of salmonid fish distribution by species, as determined from sampling by Forest Service personnel, is depicted on fish distribution maps included in the project file, and reflected in geographic information system (GIS) maps included with this analysis (Fisheries Report Rief 2012).

Table 172. Fish species by stream in the Stonewall Project area

Stream	Salmonid Fish species present on forest based on sampling *	WCT genetic status	Comments
Lincoln Gulch	No fish on forest		Intermittent flows and extensive mining impacts limit fishery throughout much of the Lincoln Gulch drainage.
Unnamed tributary NW ¼ S 20 T14N R9W	No fish, but does have perennial flow		
Unnamed tributary SW ¼ S8 T14N R9W	No fish; intermittent flows		
Unnamed tributary SW ¼ S9 T14N R9W	eb		
Beaver Creek	Wct, eb, bt, LL	Genetically pure	Bull trout are known to have been present in Beaver, Klondike, and Theodore creeks. The probability of bull trout to be present is low in other streams, but because habitat is suitable to support them bull trout are assumed present.
Theodore Creek	Wct,eb, bt	Assumed pure	
Yukon Creek	Wct, eb	Assumed pure	
Klondike Cr	Wct and bt	Assumed pure	
Unnamed tributary to Yukon Creek	Wct	Assumed Pure	
Stonewall Cr	Wct	Genetically Pure	Probability of bull trout to be present is low on Forest but because habitat is suitable to support them bull trout are assumed present. Bull trout may be present off forest. Brook and brown trout present on nonfederal lands.
Park Creek	Wct	Genetically Pure	Probability of bull trout to be present is low on Forest but because habitat is suitable to support them bull trout are assumed present. Bull trout may be present off forest.
Liverpool Creek	Wct	Genetically Pure	Probability of bull trout to be present is low on Forest but because habitat is suitable to support them, bull trout are assumed present. Bull trout may be present off forest.
Sucker Creek	Wct	Assumed pure	Probability of bull trout to be present is low on Forest but because habitat is suitable to support them bull trout are assumed present. Bull trout may be present off forest.
Keep Cool Creek	Wct and eb	Genetically pure	Bull trout are known to be present on nonfederal lands below the Forest.

* Fish Species: wct –westslope cutthroat trout, eb- eastern brook trout, LL-brown trout, bt- bull trout, wf-mountain whitefish

Threatened, Endangered and Sensitive Aquatic Species

Bull Trout

On July 10, 1998 bull trout (*Salvelinus confluentus*), were listed as Threatened within the Columbia River Basin by the U.S. Fish and Wildlife Service (USDI Fish and Wildlife Service 1998). Section 7(a) (2) of the Endangered Species Act (ESA) of 1973 as amended requires all federal agencies to review actions authorized, funded, or carried out by them to ensure such actions do not jeopardize the continued existence of listed species.

The distribution of bull trout is limited to drainages west of the continental divide on the Helena National Forest with the strongest populations being present in the Blackfoot River drainage. Bull trout are present in extremely low numbers within the Little Blackfoot River drainage. Table 172 lists the streams known currently to support bull trout in the project area.

The Inland Native Fish Strategy (USDA 1995), established priority drainages for bull trout, however, none are found within the project area. Importantly, special emphasis watersheds for bull trout were later designated throughout Region 1 of the Forest Service to supplement the INFISH priority watersheds, but none are found within the project area.

Designated critical habitat for bull trout includes reaches of the Blackfoot River and several tributaries in the Blackfoot drainage. All critical habitat for bull trout in the Blackfoot River is located downstream of the project area.

A Draft Bull Trout Recovery Plan was completed in 2005 (USDI Fish and Wildlife Service 2005). The Draft Recovery Plan was revised in 2014 (USDI FWS 2014) and to be finalized in 2015. Under the Draft Recovery Plan, bull trout within various drainages are organized by core populations and then by local populations within those core population areas. It is important to note that there are no local populations of bull trout located currently within the project area, but it is likely that some bull trout from Beaver Creek contribute to the overall Blackfoot Core Population. The information on the bull trout core population that follows is based on information from the U.S. Fish and Wildlife Service as well as knowledge from local fishery biologists from the Forest Service, and Montana Fish, Wildlife, and Parks.

Blackfoot Core Bull Trout Population

Bull Trout in the Blackfoot River are included as a core population in the Draft Bull Trout Recovery Plan (2005 and 2014). There are several local populations identified within the Blackfoot Core Bull Trout Population; including the North Fork of the Blackfoot River, Monture Creek, Landers Fork/Copper Creek, Cottonwood Creek, Belmont Creek, and Gold Creeks.

Based on redd counts and limited electro-fishing efforts, it is likely that there are somewhere between 400 to 500 adult bull trout between the 5 local populations. Additional adult bull trout are in numerous other streams throughout the core population area, and in some of the designated INFISH Priority Watersheds and Special Emphasis Watersheds, as well as in undesignated streams. The overall number of bull trout adults included in all of the streams throughout the Blackfoot drainage is probably less than 800 when combined with the adults in the local populations. Recent redd surveys suggest that four of the five Local Populations are declining somewhat while the Copper/Landers population is improving.

Bull trout may suffer from some competition with brown trout and predation in the main stem Blackfoot River, although there is no field documentation of this hypothesis. Both species occupy some of the same habitat and eat some of the same foods and both species are highly piscivorous. Consequently, the hypothesis seems reasonable. With temperatures in the main stem Blackfoot rising based on information collected by the Montana Department of Fish, Wildlife and Parks over the last 10 years (Pierce et al. 2008, pp. 32 and 33); brown trout may be gaining some competitive edge over bull trout.

Interactions of bull trout with brook trout occur mostly in tributary streams rather than the main stem Blackfoot River. Brook trout are present in some of the local bull trout populations and many of the other streams in the Blackfoot River drainage, so there is some additional threat of decreased bull trout production due to hybridization. Additional discussion on aspects of bull trout biology and interactions with other species as a function of proposed project activities are addressed further in the biological assessment.

Westslope Cutthroat Trout

Westslope cutthroat trout (WCT) are a designated sensitive fish species by the Forest Service and are included as a management indicator species in the Helena Forest Plan. Westslope cutthroat trout are found within all the streams in the project area known to support a fishery with the exception of the tributary to Lincoln Gulch, which is known to support only brook trout. There is a strong WCT fluvial population functioning in the Blackfoot River drainage. Fluvial WCT may also be using the reaches of other streams in the project area below the Forest Service boundary. Several publications from the Montana Department of Fish, Wildlife and Parks between the mid-1990s and 2007 provide extensive discussions of WCT movements and life history in the Blackfoot drainage.

It is important to maintain viability of the westslope cutthroat trout conservation populations to reduce the risk of the species being listed under the Endangered Species Act (ESA). Currently, the WCT in the Blackfoot River are a conservation population, and with the exception of those above Nevada Creek Reservoir, function as a single meta-population. The population consists of both fluvial and resident components (Pierce et al. 1997, p. 73). Radio tracking of WCT indicates wide-ranging movements and use of various tributaries for spawning (Pierce et al. 2004, pp. 63-78).

The potential for loss of viability for the Blackfoot River WCT conservation population is presumed to be low due to the extensive distribution of WCT throughout the drainage, and the presence of a functioning fluvial population. However, nonnative fish especially brook trout and to some degree brown trout, are likely competing with and sometimes preying on WCT in portions of the Blackfoot River and selected tributaries.

Western pearlshell mussels

Western pearlshell mussels (*Margaritifera falcate*) may be one of the longest living freshwater invertebrates and animals. Specimens have been aged at greater than 90 years (Vannote and Minshall 1982). The western pearlshell mussel has an elongate shell, typically 2.5-4 inches long with a concave ventral edge. The interior shell has a purple to pink hue as the outside shell is dark brown to black. These mussels are found in cool, stable running, generally low to moderate gradient streams and rivers. Swift stream velocities can limit where mussels can occur in streams. They are most commonly found in stable gravel and pebble benthic substrate, but can occur in sand or gravel among cobble and boulders in moderate to higher gradient larger rivers. They usually occupy reaches of stream where the riparian zone is dominated by willows or alders.

The larval stage of this mussel (glochidia) briefly parasitizes a host fish, westslope cutthroat trout, by attaching to the gills. They fall off the host as a juvenile mussel. The larval parasitism on fish enables upstream transport to habitats otherwise difficult to reach by relatively immobile adult mussels. Western pearlshell glochidia are considered highly host specific (Bauer 1987) as they are typically restricted to salmonid fishes.

The western pearlshell mussel continues to experience significant range reductions over the last 100 years. The primary cause of stream habitat deterioration in Montana is high fine sediment load, related to agricultural practices, which is one of the most serious pollutants of streams systems. Excess fine sediment can degrade mussel habitats by decreasing substrate permeability. This has a smothering effect on juvenile mussels and limits successful recruitment (Stagliano 2010).

The Montana Natural Heritage database contains no records for this species in the project area, although they have been found in the Blackfoot River downstream of the project area. Habitat predicted as suitable for western pearlshell mussels is present in a portion of the project area where Westslope cutthroat trout are present. Based on this information, we believe pearlshell mussels could be present in the analysis area.

Aquatic Habitat

Streams currently known to support fisheries located within this analysis area include Beaver Creek, and tributaries to Beaver Creek which include Yukon Creek, Theodore Creek and Klondike Creek. Stonewall Creek also supports a fishery. The lower reaches of Beaver Creek and Stonewall Creek are located on private and State land. Both flow into the Keep Cool drainage within 3 miles above the confluence with the Blackfoot River.

Lincoln Gulch

Lincoln Gulch is a second-order tributary that enters the Blackfoot River at river mile (rm) 103.6. The upper 4.4 miles of Lincoln Gulch watershed is located on the Forest. Lincoln Gulch drains the eastern slopes of Black Mountain. The lower 2.6 miles flows through private agricultural land and a residential housing area. Lincoln Gulch shows impacts from mining, grazing and agricultural activities. In the headwater areas mining impacts and channelization are extensive. Fish surveys found brown trout and sculpin at mile 0.1. Surveys conducted higher in the watershed found no fish (Pierce and Podner 2006).

Beaver Creek

This stream forms near Reservoir Lake and is a third-order tributary to Keep Cool Creek, entering 0.7 miles upstream of the Keep Cool Creek confluence with the Blackfoot River (rm 105.2). Beaver Creek has a total of 20.1 stream miles of which 14.3 miles are perennial. In the Beaver Creek drainage on NFS land, past and present road construction, timber harvest and livestock grazing have influenced habitat conditions by increasing the sediment delivered to the stream. The lower reaches of Beaver Creek are located on private and State lands that support agricultural uses. There are some reaches where livestock grazing has negatively influenced bank stability (Peters 1990) and some isolated bank damage occurs from livestock grazing on the Forest. Bank trampling from livestock is limited in the higher reaches due to the inherent resistance of the stream channel type and the vegetation adjacent to the streambank. A water diversion is present just below the Forest boundary which partially dewaters the stream. This diversion was recently upgraded to provide fish passage. Beaver Creek maintains a moderate gradient originating at Reservoir Lake.

Fish habitat is in relatively good condition with good quality cover for fish present throughout the reaches evaluated. The amount of cover present is somewhat low on some of the reaches with quality pools estimated to be present at around 15 to 20 percent. Past beaver activity has been very important in the formation of habitat on selected reaches of stream downstream of Yukon Creek. Spawning gravels contain an average of 30.5 percent fines. Recreational fishing does occur on this stream within the Forest, but the intensity of fishing and the amount of harvest is unknown. Downstream of NFS lands, Beaver Creek is at least partially dewatered for irrigation and the stream gradient drops to near 1 percent in the vicinity of beaver activity (USDA 1995b).

Discharge was 10.7 cfs 0.50 mile above the mouth on August 31, 1989. Fine sediment levels in spawning gravels were found to average 33 percent in Beaver Creek with a range of 17 to 55 percent. In comparison, an unmanaged drainage of similar geology that had undergone high sediment delivery from fire averaged 27 percent with a range of 19 to 32 percent (Peters 1990).

Theodore Creek

The Theodore drainage shows past timber activity in the lower reaches. The lower reaches are located in the Stonewall allotment. This stream is a tributary to Beaver Creek that originates south of the Scapegoat Wilderness. The entire drainage lies within the Forest. Electro-fishing evaluations have shown that the lower reaches are dominated by cutthroat trout with a few brook trout also present. The upper reaches were found to support cutthroat trout exclusively. Fish distribution extends upstream into section 21 (T15N R9W). Abundance of salmonids over 6 inches in length was estimated at 160 per mile of stream while the maximum size obtained was around seven inches. It is likely that some of the cutthroat trout from Theodore Creek recruit downstream to Beaver Creek. Historical sampling in 1987 documented three bull trout in Theodore Creek below the road culvert on 4106 near the mouth.

Habitat conditions on the reaches evaluated were very good in Theodore Creek. Much of the pool habitat in the stream is formed by large rubble cascades and woody debris. Spawning gravels were found to average 32.1 percent fines. Theodore Creek is too small to support much if any recreational fishing and no evidence of use by anglers was noted during survey evaluations (USDA Forest Service1995b).

Yukon Creek

This drainage is entirely within the Forest and is a tributary to Beaver Creek. The lower reaches show evidence of some timber harvest activity. The lowest reaches are within the Stonewall allotment. Yukon Creek is dominated by cutthroat with some brook trout present in the lower reaches. Abundance was estimated at 220 fish per mile of stream over 6 inches in length. Fish distribution extends upstream into section 17 with the headwater reaches likely supporting only cutthroat trout. This stream is important for providing recruitment of cutthroat trout to Beaver Creek. Walk-through evaluations indicate that habitat is in good condition. Some sediment delivery to the stream is still occurring at the upper culvert site which was constructed several years ago, however seeding the site has helped to mitigate the delivery.

Spawning substrates contain 34.2 percent fine sediment on the average. Yukon Creek is large enough to support some recreational fishing, but no evidence of fishing use was observed. In 1992, two instream pool structures were constructed to increase fish habitat capability (USDA Forest Service 1995b).

Unnamed Tributary to Yukon Creek

This stream is a tributary to Yukon Creek and is located entirely on the Forest. This drainage shows evidence of past timber harvest activity. Only the lowest reach containing the confluence with Yukon Creek is located in the Stonewall allotment. This is a very small stream that was found to support only cutthroat trout. Abundance of fish over 6 inches in length is 70 per mile of stream. The distribution of fish extends upstream in section 19 (T15N R9W). This stream probably provides for recruitment of cutthroat trout to Yukon and Beaver Creeks. Walk-through evaluations indicate that habitat is in relatively good condition. Spawning gravels measure 35.1 percent fines (USDA Forest Service1995b).

Klondike Creek

This drainage shows evidence of past timber harvest activity. The lower reaches are located within the Stonewall allotment. This stream is a tributary to Beaver Creek and is entirely located on the Forest. The stream is dominated by cutthroat trout with an occasional brook trout. Historical sampling in 1987 documented a single bull trout in Klondike Creek. Fish distribution likely extends upstream into section

20. The maximum size of fish obtained during sampling was just less than 7 inches in length. Abundance of fish over 6 inches in length was estimated at 120 per mile of stream. This stream also provides recruitment of cutthroat to Beaver Creek. Walk-through evaluations indicate that habitat conditions are relatively good with numerous small pools formed by large rubble and woody debris. Spawning gravels averaged 32.7 percent fines. Klondike Creek is too small to support recreational fishing, but in an attempt to increase habitat capability eight instream pool structures were constructed in 1992 (USDA Forest Service 1995b).

Stonewall Creek

Stonewall Creek has a total stream length of 9.0 miles of which 3.8 miles are perennial. The Stonewall drainage shows evidence of past timber harvest in the middle reaches. A portion of the lower reaches is located in the Stonewall allotment. A small patented mine is located in the upper reaches. The lowest reaches are located on private ranch land and are seasonally dewatered before reaching Keep Cool Creek. In Stonewall Creek, fine sediment levels were found to average 31 percent with a range of 21 to 50 percent as compared to an undisturbed stream of similar geology having an average of 20 percent with a range of 11 to 26 percent. Other habitat parameters have not been measured. Cutthroat trout are common in the drainage (USDA Forest Service 1995b). On private land, Stonewall Creek shows effects from agricultural uses. Stonewall Creek flows through a large wetland on private land before its confluence with Keep Cool Creek.

Park Creek

Park Creek is a second-order tributary to Stonewall Creek. Park Creek has a total stream length of 6.1 miles, of which 2.9 miles are perennial. The headwaters and upper reaches of Park Creek are located on the Forest; the lower reaches are located on private land. The creek may be dewatered in the lower reaches. Spawning gravel quality has not been measured. Cutthroat trout have been determined to be genetically pure but are uncommon in Park Creek.

Liverpool Creek

The headwaters and upper reaches of Liverpool Creek are located on the Forest, and the lower reaches are located on private land. This drainage is located within the Keep Cool Liverpool allotment. The stream has been channelized by mining on the Forest. Eight drop-log structures have been built in the creek to provide much needed pool habitat. One downed tree was placed in the creek to provide for rearing habitat. A portion of the area mined has been reclaimed, but occasional suction dredging continues in the channel. Spawning gravels are common in the stream. Below the area mined spawning gravel quality measured 42.7 percent fines. Above the mined area spawning gravels measured 25.4 percent fines. Obviously, mining has had negative effects on the quality of spawning habitat in Liverpool Creek. Cutthroat trout are common both above and below the mined area (USDA Forest Service 1995b).

Sucker Creek

Sucker Creek has a total length of 3.0 miles, of which 2.5 miles are perennial. Only the headwaters of Sucker Creek are located on the Forest. The middle and lower reaches are located on private land. Timber harvest and road construction has taken place in the drainage. Sucker Creek drainage is located in the Keep Cool Liverpool allotment. Spawning gravel quality has not been measured. Cutthroat are rare in some reaches and in higher densities in other reaches, and are presumed genetically pure in Sucker Creek (USDA Forest Service 1995b).

Keep Cool Creek

Keep Cool Creek is the largest spring creek in the Lincoln Valley. It forms north of Lincoln from both an alluvial groundwater aquifer and small basin-fed streams in its headwaters. It is joined at the mouth by

Beaver Creek (mile 0.7) and Lincoln Spring Creek (mile 0.5) before entering the Blackfoot River at mile 105.2. The combined flow of this stream system provides a significant percentage of the upper Blackfoot River flow during low flow periods. Excessive livestock access to riparian areas has degraded portions of Keep Cool Creek and its tributaries. Other mainstem fisheries-related impairments include channel alterations and irrigation practices.

Keep Cool Creek has a total length of 10.7 miles, of which 2.0 are perennial. The upper and middle reaches of Keep Cool Creek are located in the Helena Forest. The lower reaches are located in private land. The upper elevations of the drainage show evidence of timber sale activity and are heavily and roaded. The drainage is within the Keep Cool Liverpool allotment. Spawning gravels just above the Forest boundary measure 47.2 percent fines. Spawning gravels are common in this area; however, the flows become very low early in the season. Cutthroat trout are common in Keep Cool Creek (USDA Forest Service 1995b).

Recently, radio telemetry confirmed bull trout from the Blackfoot River use the lower portion of Keep Cool Creek (Pierce et al. 2004). Water temperature monitoring at two locations found maximum summer temperatures of 75.2 ^{o}F in Keep Cool at the Sucker Creek Road compared to a high of 62 ^{o}F downstream at the Beaver Creek Road. This cooling results from large inflows of groundwater between these two sites (Pierce et al. 2004).

Table 173 that follows, lists streams that support resident fish populations in the project area that have been sampled for sediment (less than 6.4 mm) by depth using McNeil core sampling methods to quantitatively establish estimates of fines in fish reproductive habitat.

Table 173. Summary of mean percent fines (<1/4 inch dia.) in spawning habitat of select streams as an indicator of cumulative effects from past and ongoing cumulative effects by 6^{th}-field HUC

6^{th}-Field HUC sub-watershed (name)	Stream(s) sampled for sediment analysis	Mean % fines in spawning habitat *	USEPA reference Standard (%) **	Roadless Area reference (%)
17010203 (Beaver Creek)	Beaver Creek	30.9	32.5	31.9
	Yukon Cr	34.2		
	Tributary to Yukon Cr	35.1		
	Theodore Cr	32.2		
	Klondike Cr	32.7		
17010203 (Stonewall/Park)	Stonewall Cr	31.6	32.5	31.9
	Park Cr	45.4		
17010203 (Lincoln Gulch)		Not sampled as no fishery present in most of the drainage	32.5	31.9
17010203 (Sucker/Liverpool)	Liverpool sw 1/4	42.7	32.5	31.9
	Liverpool nw 1/4	25.4		
	Sucker Cr	Not sampled		
	Keep Cool Cr	47.2		

*Averages for individual years are detailed in Fish Information for Stone Dry Watershed Analysis (Burns 2006).

** Reference standard developed from Helena National Forest Data in the Lake Helena Watershed

Summary of Fish Habitat

Fish habitat in the planning area is basically the product of interactions among underlying geologies, soils, topography, vegetation, climate and hydrology unique to the watershed (Meehan 1991, p. 5; Swanston 1991, p. 139). These drainage characteristics and processes remain fairly constant, setting up conditions for optimum productivity of aquatic life forms (Meehan 1991, p. 5). When natural disturbance reshapes stream channels, the actual effects of such changes on aquatic organisms are often short term. In their natural context, accessory processes like fire, flood flows, insect infestations, and animal activities (e.g. beaver) operate on the stream system to produce improved habitat quality and productivity in the long term (Swanston 1991, p. 139-142).

Human land-use activities can disrupt the balance of these interactions producing persistent changes in habitat that can reduce natural fish production and population viability (Meehan 1991, pp. 1-6; Waters 1995, pp. 1, 17). The Stonewall Project area has historically implemented projects such as timber harvest, livestock grazing, mining, recreation and transportation. Cumulatively, these activities impair stream structure and function to varying degrees by increasing erosion and sedimentation, impacting water quality, altering flows, reducing vegetation cover, and destabilizing or degrading channels. Past and ongoing actions, including the transportation system that has been assessed for hydrologically connected sediment delivery sites and culvert crossings, cumulatively set the stage for existing conditions of sediment in fish reproductive habitat. Without mitigation or other corrective actions to protect and recover habitat, these factors suppress the natural fish production capabilities (carrying capacity) of streams (Hicks et al. 1991, pp. 484-485).

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under alternative 1 there would be no new road or ground based timber harvest to change the level of sediment delivered to streams. Sedimentation levels may change due to ongoing management. Taking “no action” to address motorized roads and trails in managed watersheds (like those in the project area) almost always results in the same or increased levels of sedimentation over time. Hydrologically linked roads, a significant unnatural source of chronic sedimentation, would remain untreated contributing 11 tons of sediment in excess annually within project watersheds. Although old, infrequently used roads would continue to revegetate, reducing the amount of sediment produced and possibly contributed to streams; all of these old roads would continue to have varying degrees of impact to watershed hydrology and water quality. Stream channel and road fill scour, channel aggradations, and risk of sediment contribution from failure of undersized stream crossings would persist until otherwise addressed.

No timber harvest is proposed under the no-action alternative, and therefore no change in the timing or magnitude of peak flows is expected. Alternatively, there would be no measures taken to promote change in function for any stream within the project area that is not currently at desired conditions.

Alternative 1 would fail to promote improvement in stream habitat conditions for Westslope cutthroat trout (MIS), bull trout or for other aquatic populations that exist in streams. Thus, certain aquatic populations would remain at lower densities than those in streams that are functioning properly and where habitat quality and quantity are nearer potential. Average fine sediments in trout spawning habitat would remain elevated in some of the project area streams (table 173) in contrast to approximately 33 percent average fine-sediment levels determined for reference streams across the Helena National Forest.

Alternative 1 would fail to promote improvement in riparian habitat conditions in the project area. Because there would be “no action” there would be no measures taken to change the function for any riparian area within the project area.

Alternatives 2 and 3

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to fisheries and other resources is displayed in table 9, chapter 2.

The specific design features listed under soil, watersheds and fisheries in table 9 pertaining to hydrology are S/WS/F-15, S/WS/F-16, and S/WS/F-17.

This analysis is based on the implementation of all design features. Project design features apply to all action alternatives. Design features that are applicable to fisheries include not only those listed above, designed specifically to protect fish and fish habitat, but also those designed to protect other resources such as soils and water quality/quantity.

Effects Common to All Action Alternatives

Roads

Road maintenance and improvement best management practices (BMPs) would be applied to all roads used in the project, including application of aggregate at road/stream crossings and other sediment delivery points. Project design features apply to all action alternatives (table 9).

There would be a short-term (5-7 years) reduction in sediment transport from roads in the project area resulting from road improvements planned in this alternative. Forty-eight miles of road proposed for hauling in alternative 2 and 44 miles of road proposed for hauling under alternative 3 would receive BMP maintenance (table 165 in the Hydrology Section). Project-related road improvements include surface grading, re-establishment of drainage features (grade dips and ditch-relief culverts), and application of gravel at stream crossings and other sediment delivery points. Sediment levels would increase during the project as a result of ground disturbance during maintenance and when culverts are installed (table 166 in the Hydrology Section). There are about 2.6 miles of road that would be built then obliterated immediately following timber removal (new and “new specified”) planned in these alternatives. Most of these road segments are not predicted to convey sediment to stream channels, as they would be built in upland locations without surface hydrologic connection to any stream channel. After the project there would be an overall decrease in sediment sources from roads (table 166 in the Hydrology Section).

The proposed new road segment number 4, which would provide access to units 20 and 21, crosses the drainage of a headwater tributary basin to Lincoln Creek (chapter 2). This crossing was reviewed in the field—there is a vegetated old roadbed at this site, but no stream channel or evidence of overland flow. Channel features were observed roughly 60 feet below the roadbed. Sediment that appeared to be from the old roadbed was observed in this channel, indicating that in the past, this road probably contributed sediment to the uppermost reach of this intermittent stream. If restored, this road represents a potential source of sediment to the stream channel, and should be accounted for in estimates of sediment impacts of the project. If the decision is made to construct this segment, then appropriate measures (Best Management Practices) such as adequate culvert, proper road drainage, and sediment fencing (if appropriate) must be applied, and the segment should be obliterated soon after the project ends, to minimize sediment impacts.

The proposed new road segment number 5, which is between units 10 and 11, crosses a small drainage of a headwater tributary basin to Lincoln Creek. This apparent crossing was reviewed in the field—there is an old abandoned irrigation ditch at this site, but no stream channel or evidence of overland flow. Flow may occur in the ditch during snowmelt. If the decision is made to construct this segment, then appropriate measures (Best Management Practices) such as adequate culverts, proper road drainage, and sediment fencing (if appropriate) must be applied, and the segment should be obliterated soon after the project ends, to minimize sediment impacts.

The total reduction in average annual sediment transport from using BMPs for project haul roads was modeled to be roughly 2 tons less than the existing conditions under this alternative, based on proposed BMP upgrades and road improvements. The long-term benefits from decreased annual sediment loads would outweigh the short-term increases during road maintenance activities. For the road segments to be obliterated, the reduction in sediment delivery would be permanent.

BMPS

INFISH (USDA Forest Service 1995) standards would need to be met. A key component of INFISH for this project includes measures to address roads that have high risk for sediment delivery to surface waters, see the Transportation Report (Bielecki 2012) and Hydrology Report (McNamara 2015) in the project file for specific roads and BMP details.

Riparian Areas

In all units, INFISH RHCAs will be delineated and standard widths will be maintained for each category of stream or water body. All standards and guidelines for timber, roads, fire/fuels and general riparian area management will be implemented. Project design features were adopted to provide additional benefit to habitat features and maintain riparian management objectives. These features include no removal of dead trees needed for woody debris recruitment or floodplain within the RHCA, no pre-commercial thinning in RHCAs, no ignition in burn units within the RHCA, and efforts would be taken to prevent fire from backing into the RHCAs. No harvest will occur in the RHCAs except for hazard trees.

Cold water is a key factor related to the health and survival of native trout, especially bull trout. Bull trout are most common in streams that rarely exceed 13oC (55oF). Westslope cutthroat are most common in streams that rarely exceed 15oC (59oF) (Isaak 2014). Bull trout typically spawn in water temperatures below 9°C (48°F). Montana Fish Wildlife and Parks has implemented a policy for critical bull trout spawning and rearing streams where fishing closures may be initiated when daily maximum water temperatures equal or exceed 15.6°C (60°F) for three consecutive days. INFISH Riparian Management Objectives identify a goal of not measurably increasing maximum water temperatures (warmest 7-day average of daily maximum temperature) and identify the maximum water temperatures below 15°C (59°F) within adult holding habitat and below 8.9°C (48°F) within spawning and rearing habitats. Water temperature monitoring in Beaver Creek in the project area determined the warmest 7-day averages of daily maximum temperature in 2011 and 2012 were 9.5°C (49°F) and 9.9°C (50°F), respectively. Water temperatures currently appear suitable for native trout; implementation of the RHCA guidelines and standards as well as the Project Design Features will maintain riparian and stream habitat and the project would have little potential, if any, effect on stream temperatures.

It is likely that other areas requiring INFISH buffers would be found during vegetation unit layout that are not currently identified on project area maps. Any areas identified during implementation would have the appropriate buffers and mitigations applied to them to meet INFISH (USDA 1995) and Helena Forest Plan standards.

Additional measures to reduce risk for negative effects to native fisheries entail restrictions on removal of trees from riparian habitat conservation areas to ensure the potential for woody debris recruitment, pool formation and floodplain function is maintained (table 9)

As provided for with INFISH standard RA-2, trees to be removed as part of salvage, that are not needed for woody debris recruitment or floodplain needs, can be removed. “Green commercial trees within the RHCA that have not been attacked by beetles and are not otherwise at risk of dying in the immediate future cannot be removed unless site-specific rationale discussing why it would be beneficial to fish and watershed is developed for each specific unit. Log landings should not be located in RHCAs.”

Category 1 - Fish bearing streams: The RHCA width is 300 feet on either side of the stream or the 100-year floodplain whichever is greater.

Category 2 - Perennial streams not supporting fish: The RHCA is 150 feet on either side of the stream.

Category 3 - Lakes or wetlands greater than one acre: The RHCA is a minimum of 150 feet but can be larger and extend to the outer limits of riparian vegetation, the extent of seasonally saturated soil, the extent of highly unstable areas, or the distance equal to the height of one site-potential tree.

Category 4 - The project area is not within INFISH priority drainage: For seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides and landslide prone areas, the RHCA boundary is one-half site potential tree from the edges of the stream channel, wetland or landslide, landslide prone area or a 50-foot slope distance, whichever is greatest.

For both action alternatives, riparian areas would have at least a 50-foot no ignition buffer around ephemeral, intermittent, and perennial channels for slopes less than 35 percent, and a 100-foot buffer for slopes more than 35 percent. Fire would be allowed to back into INFISH buffers. Alternatives 2 and 3 would allow for dead trees to be removed from RHCAs. These trees are not providing shade to the stream and not in a position (across the road) to become woody debris. Removal of dead trees and allowing fire to back into RHCAs would allow riparian shrubs and trees to reestablish. Roads to be built and then obliterated are short segments that would be temporary in nature and not likely to change the character or function or the RHCAs. Therefore, activities proposed under these alternatives would not adversely affect riparian areas. Streams within the project area would generally remain at proper functioning condition.

Fish

Trout use redds (nests dug by fish in streambed gravels) in flowing waters for their reproductive strategy. When excessive sediment accrues to spawning and rearing sites, trout embryo and fry success decline below natural rates. Additionally, other trout life history elements such as juvenile survival, growth, and adult survival also can be at risk if excess sediment reduces cobble spaces in riffle areas and pool volumes. Everest et al.1987, p. 133 concluded that salmonid species can cope with the natural variability in sediments, but their populations can be reduced substantially by persistent sedimentation that exceeds the natural levels under which they evolved. Average fine sediments in trout spawning habitat within project area streams may show short-term increases in fines at depth. In the long term, stream channels would show measurable decreases in the levels of fines as project area roads would deliver roughly 2 tons less sediment per year.

Given the number of acres that would be treated in the project watersheds under alternatives 2 or 3, it is unlikely there would be a cumulative increase in water yield that would be detectable. The estimated water yield increase for project watersheds is below the DEQ-recommended threshold of 10 percent. Streams emanating from project watersheds appear to lose flow as they move from steeper areas and encounter deep valley floor sediments. Considering the dry (losing stream) nature of the channels in the

Stonewall Project area watersheds, the potential increase in water yield would be unlikely to cause any negative effects (i.e., accelerated bank erosion).

Therefore, this vegetation treatment proposal may result in short-term impacts to fisheries resources from road maintenance treatments. The project incorporates special design elements that reduce sedimentation risk by incorporating RHCA buffers and use of low-severity burns. Most importantly, long-term sediment reduction (improvement) in trout reproductive habitat is predicted due to road BMP measures and culvert upgrades that also reduce flood hazard risks at these critical road/stream intersections.

Cumulative Effects

A list of past, present and reasonably foreseeable future activities is available in appendix C. Management activities that are most likely to influence aquatic species abundance, distribution and possibly persistence of populations are discussed in this section.

Livestock grazing: There are three Forest Service allotments that affect watersheds in the project area, Beaver Creek HUC (3,510 acres), Keep Cool Creek HUC (785 acres), and in the Lincoln Creek HUC (191 acres).This affects aquatic species because it alters stream morphology and vegetative conditions in the uplands and riparian areas. This changes the capabilities of hydrologic processes and stream morphology changes, reducing stream function. The result is a reduction and simplification in habitats.

Irrigation diversions: The effects on aquatic species occur through the loss of instream flows and possibly temperature increases and loss of individuals in irrigation ditches. In some cases, diversion may benefit WCT because it is limiting upstream movement of nonnative species that would hybridize and/or compete with them.

Noxious weed treatment: Beneficial effects are expected from reversing trends in vegetative conditions. Potential negative effects if herbicides contact individuals directly. Risk is low for this; the HNF weed treatments are applied according to the label and provide mitigations to reduce risks of introduction of herbicide into streams and other water bodies. We expect the balance of effects related to this management to be beneficial.

Mining: Historic mining has had major affects to water quality and stream function in the project area, but there are no known water quality or stream channel conditions caused by historic mining that would be affected by the proposed activities. Placer operations have altered the physical function of some stream channels through the removal of stream gravels and channelization. Several small suction dredge mining operations are proposed or on-going at this time that may have localized stream bottom and bank disturbance.

Prescribed burning: This has some risk of increasing short-term sediment delivery because of the temporary loss of vegetative cover that occurs. Recent prescribed burns occurred in Alice Creek, Hogum Creek, and Poorman Creek. This, however, is effectively mitigated in most situations through the application of treatment buffers around streams and other water bodies. Benefit would occur through longer-term improved vegetation cover in riparian and uplands, which would reduce sediment delivery.

Dispersed recreation: This is common across the analysis area and would continue – and probably increase – in the future. Effects to aquatic species are likely minor. Even though most dispersed camping and other activities occur in close proximity to water, the length of streams disturbed is relatively small. Sediment delivery from dispersed recreation can occur but it is limited enough in scope in most cases to keep it from being a notable concern relative to aquatic populations. Angling probably results in a limited amount of mortality, even though state regulations prohibit anglers from keeping bull and westslope cutthroat trout from streams in the analysis area.

Range improvements: These are expected to help with livestock distribution, decreasing impacts to streams, and so limiting negative effects on stream channel morphology and stream function.

Road and trail construction and maintenance: To support timber removal Alternative 2 proposes approximately 2.6 miles of roads to be built then obliterated immediately following timber removal; alternative 3 proposes 0.4 mile. No permanent roads or trails are proposed. Required maintenance on roads for the project would reduce sources of sedimentation in the long term by 2 tons per year that are negatively affecting aquatic species and habitat. The Blackfoot Travel Plan (non-winter) is currently under analysis. The Travel Plan proposed several miles of road decommissioning and storage project with culvert removals. Implementation of the Plan would have significant reductions in road-related sediment delivery to streams.

Timber Harvest: Private and state trust land timber sales are ongoing in the project area that is primarily tractor logging using existing roads for hauling. The DNRC timber sale (Liverstone) is approximately 260 acres may have the potential to affect watersheds. Montana Stream Management Zone no harvest buffers and use of existing roads would protect sediment delivery to streams, Forest Service timber harvest occurred previously in the area from 2000 to 2010. Use of INFISH buffers and Best Management Practices protect stream channels and reduce sediment delivery and limited negative effects on stream channel morphology and stream functions

Stream Restoration: Stream restoration projects to restore approximately stream channels impacted by past mining activities are planned in Sauerkraut and Stonewall Creeks. Removal of mining waste rock and channel improvement for improving fish habitat and channel stability utilizing primarily natural materials. Riparian and floodplain revegetation will include planting of native grass sod, forbs and shrubs. There would be short-term impacts during project construction activities but long-term benefits as the stream channels and banks stabilize.

Hazard Tree Removal: The Forestwide hazardous tree removal and fuels reduction HFRA project was recently completed. This activity was limited to certain road and trail corridors and recreation sites. Effects to aquatic populations are likely minor.

Alternative 1 (no action) would not promote a change in existing conditions within the analysis area. While this alternative meets the Forest Plan direction of “no measurable effect”, it does nothing to help ensure movement toward desired conditions. Because many streams are currently nonfunctioning or functioning at risk, alternative 1, when considered with other current, past and reasonably foreseeable actions could work cumulatively with the management activities/natural events discussed above to limit the potential to achieve healthy population densities in certain populations.

Alternatives 2 and 3 would promote improvement in stream conditions through long-term reductions in sediment delivery and physical impacts to stream channels, which would promote positive shifts in stream function across the analysis area. Therefore, the effects of the Stonewall Vegetation Project proposed actions when considered cumulatively with other past, present and reasonably foreseeable actions should promote the attainment of better habitat conditions, and more abundant and resilient aquatic populations.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternatives 2 and 3 comply with the Helena National Forest Plan, and other State and local laws, regulations, policies and plans.

Other Relevant Mandatory Disclosures

There are no other relevant mandatory disclosures for the aquatic resources in the Stonewall Vegetation Project

Species Determinations

The Biological Effects Determination for westslope cutthroat trout and western pearlshell mussel, if implementing alternative 2 or 3 is: **May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species**.

The Biological Analysis Determinations for bull trout and bull trout critical habitat is: **May effect, not likely to adversely affect.**

WCT Population Viability at the Project Level:

Westslope cutthroat trout are the fish "management indicator species" for the Helena National Forest. They represent a measure of the effects of management activities on habitat with the objective of ensuring population viability (Forest Plan p. II-17). Westslope cutthroat trout are found in Stonewall planning area, and therefore, serve as the proxy population for viability analysis in fulfillment of the NFMA viability requirement.

This analysis uses a practical approach outlined in Ruggiero et al. (1994) and Region 1 guidance (Draft 01/30/2004) in conjunction with criteria established by Rieman et al. (1993). Simply put, "…an analysis of population viability is about birth, death, immigration, and emigration rates and how environmental or ecological factors affect these rates over time" (Ruggiero et al. 1994, p. 366). In this exercise, select habitat attributes considered both ecologically significant to fish and sensitive to land management disturbances are borrowed from Overton et al. 1995, p. 1), and Region 1 guidance (USDA Forest Service Draft 1/30/2004).

Table 174 displays these habitat attributes and which ones are affected by this proposal. Projections of change in any habitat attribute provide an indication whether negative effects to species or habitat is occurring.

Table 174. WCT habitat variables from Overton and Region 1 guidance that may be influenced by proposed management in the Stonewall Project area

Habitat Feature	Effects Of Action			Comments
	Maintain	Degrade	Improve	
Bank Stability	X			Special guidance within stream buffers, SMZ regulations
Bank Undercut	X			Special guidance within stream buffers, SMZ regulations
Water temperature	X			Special guidance within stream buffers, SMZ regulations
Width-to-depth ratio	X			Special guidance within stream buffers, SMZ regulations
Width-to-maximum depth ratio	X			

Habitat Feature	Effects Of Action			Comments
	Maintain	Degrade	Improve	
Substrate composition		X	X	Degrade yr-1; improve yr 3+
Large woody debris (LWD)	X			Special guidance within stream buffers, SMZ regulations
Pool frequency	X			Special guidance within stream buffers, SMZ regulations
Invasive species	X			

Sediment in stream substrates was described being the attribute most responsive to disturbance from this project. Other attributes of fish habitat (bank stability, temperature, LWD, etc.) were excluded from further consideration due to specific project design elements—300-foot stream buffers in conjunction with state SMZs and low-severity burn prescriptions that restrict disturbance from important stream corridors.

Research has shown how increasing and decreasing levels of sediment in trout reproductive habitat affect trout embryo and fry survival rates negatively or positively respectively. When fine sediments elevate beyond natural levels in trout spawning habitat, the reproductive quality of that habitat diminishes resulting in a corresponding decrease in fry production. Mathematical equations to estimate existing and predicted embryo survival as a function of changes in sediment suggest success rate of hybrid WCT fry survival for this stream drops to 57 percent (from 62 percent) in year-one, and then improves to 78 percent after year-three as a result of sediment source reduction treatments to road # 423 and 423-D1. Estimates of changes in the rates of embryo survival are not necessarily accurate, but are meant to help determine the amount of changes in sediment yield upon WCT populations in question.

This analysis, therefore, predicts a short-term change in substrate composition risks, some minor downward trend in incubation and fry emergence success (birth rate) to the population before recovering to an improved trend over baseline after 3 years. WCT recruitment is likely more than adequate to offset minor short-term sediment increases near the populations in Beaver Creek and Keep Cool Creek.

In the long term, treating hydrologically connected roads helps recover gravel quality slightly over baseline conditions. Therefore, there is some minimal risk to viability for this WCT population in the short term with a long-term trend of maintaining reproductive habitat within the acceptable range of variation (32.7% ±9.9%).

Recreation

Introduction

This analysis describes the existing recreation activities, settings and opportunities within the Stonewall Vegetation Project area, and describes the potential effects to recreation from proposed activities. Portions of the Stonewall Project area are within the Bear-Marshall-Scapegoat-Swan and Lincoln Gulch Inventoried Roadless Areas (IRAs). The potential effects to roadless and wilderness characteristics of the IRAs and unroaded lands contiguous to the IRAs are in a separate section beginning on page 685.

Overview of Issues

Comments pertaining to disclosing the effects of project activities on recreation were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to volume 2, appendix A of this document for a complete listing of the issues and an explanation of how the agency determined their disposition.

Indicators

Indicators are defined to analyze data regarding the potential for impacts of vegetation treatments and prescribed fire on recreation opportunities within the project area, and the impacts of prescribed fire on trail conditions within the project area

- Loss of recreation opportunity, displacement of users, or a change in recreation experience due to vegetation treatments/prescribed fire activities (i.e., temporary closure of areas/visitors avoiding the area during the vegetation treatments/prescribed fire, or changes in scenery following the vegetation treatments/prescribed fire that affect the recreation setting)
    - **Measure: Life of the project**
- Increased trail maintenance needs following prescribed fire (i.e., increased erosion due to runoff or fallen trees)
    - **Measure: Miles of trail affected**

Methodology

An interdisciplinary team meeting and field tour of the proposed project area was attended in Lincoln, Montana, by specialists on September 20-24, 2010.

Analysis was accomplished using ArcMap and relevant Geographic Information System (GIS) data layers from the Helena National Forest, Lincoln Ranger District, including trails, roads, recreation sites, inventoried roadless areas, summer and winter ROS classes, winter use, and management areas. Online visitor information provided by the Helena National Forest and other local organizations provided an overview of the recreation opportunities and trends within the analysis area. A review of existing law, regulation and policy relevant to recreation resources within the project area was completed and are referenced where appropriate.

Spatial and Temporal Context for Effects Analysis

The potential direct and indirect effects to recreation resources were considered within the Stonewall Project area boundary. The direct effects would be short term and temporary, occurring during project implementation. The longer-term indirect effects would relate to ecosystem restoration, changes in visual qualities, and other items within the project area that would influence the recreation setting.

Cumulative Effects Process

Cumulative effects to recreation within the Stonewall Project area boundary would relate to other administrative or Forest management activities occurring within or immediately adjacent to the project area. Cumulative impacts would result if other activities take place during implementation of the Stonewall Vegetation Project or until vegetation growth obscures the visible stumps from the vegetation treatment activities and prescribed fire, approximately 3-5 years. A complete list of past, present and reasonably foreseeable activities is in appendix C.

Affected Environment

Existing Condition

The Forest

Fire suppression and moist growing conditions through much of this century resulted in a loss of open forest conditions and seral species (aspen, ponderosa pine and western larch). This has created a uniform landscape comprised of dense forests susceptible to insect and wildfire mortality (Douglas-fir and lodgepole pine). In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and ponderosa pine. These conditions are elevating fuel levels, which poses a wildfire threat to nearby homes and communities in the wildland urban interface (WUI).

Recreation

The project area provides access to a variety of recreation opportunities. While hunting and snowmobiling are the predominate recreation activities, other recreation uses include: camping, fishing, driving for pleasure, off highway vehicle (OHV) travel and horseback riding, hiking, firewood gathering, berry picking, cross-country skiing and wildlife viewing. The following recreation facilities are located within the project area: Dry Creek Trailhead, Arrastra Creek Trailhead and Pine Grove dispersed camping area and trailhead. The Lincoln Ranger District receives most recreation use during the fall hunting season. Winter and summer visitation is slightly lower, and spring is the least used period.

The National Visitor Use Monitoring Results from data collected in 2008 indicate that the Helena National Forest serves a mostly local client base with nearly 70 percent of visitor use coming from people who live within 50 miles of the Forest. A majority of this is day use. Approximately 60 percent of Forest visitors listed the following as their main recreation activities on the Forest: hunting, hiking/walking, cross-country skiing, viewing natural features, snowmobiling, and driving for pleasure (USDA Forest Service 2009).

The Lincoln Ranger District issues special Use Permits for special events and commercial outfitters and guides. Several commercial outfitters are authorized to operate within the Bob Marshall Wilderness Complex; these outfitters likely pass through the project area to access the Scapegoat Wilderness area during their operations.

The southern boundary of the Scapegoat Wilderness is approximately 3 miles north of the Stonewall project area. The Scapegoat Wilderness is part of the Bob Marshall Wilderness Complex. It is referred to as “The Crown Jewel of the National Wilderness Preservation System” and is a very popular place to visit for people from all parts of the country (USDA Forest Service 1986, FEIS Appendix C-29). The Arrastra Creek and Dry Creek trailheads are popular access points for the Scapegoat Wilderness and heavily used during the fall hunting season. The project area is also within the area known as the Southwest Crown of the Continent. The Crown of the Continent at a landscape level is an area that links the Canadian Rockies with the Greater Yellowstone Ecosystem and the Selway-Bitteroot Wilderness areas to the south.

The Southwestern Crown Collaborative (2010) describes this area as *“…one of the most biologically diverse and intact landscapes in the western United States. The Crown has been described as one of the premier mountain regions of the world and contains many of the largest remaining blocks of roadless lands in the contiguous US. The presence of expansive open space in the Southwestern Crown provides an abundance of outdoor recreational opportunities, from hunting and fishing to hiking and snowmobiling. Public access to streams, lakes, and private and public lands is highly valued.”*

Roads and Trails

The primary motorized access into the project area is National Forest System Road #4106, Beaver Creek Road. It provides access to the Dry Creek Trailhead, Arrastra Creek Trailhead and Pine Grove dispersed camping area and trailhead, Huckleberry Pass, and serves as an important snowmobile trail. The road is popular with local residents who want to harvest huckleberries and firewood. Additional National Forest System roads that provide motorized access into the project area are Lincoln Gulch Road #626, Lone Point Road #1824, Lincoln Ditch Road #4043, and Park Creek Road #607.

Other access into the project area is on designated National Forest System trails including Dry Creek Trail #483, Porcupine Basin Trail #488, Arrastra Creek Trail #482, Stonewall/Copper Creek Trail #485, Stonewall Mountain Trail #418, and Stonewall Trail #417. The last three trails identified are open to motorized travel. Table 175 displays information for other motorized and nonmotorized trails as well as groomed[35] and ungroomed snowmobile trails within the project area. The entire project area is currently open for snowmobile use in the winter.

Table 175. Stonewall Project area trails

Forest Trail Name	Miles within Stonewall Project Area	Trail Type
Stonewall/Copper Creek Trail #485	1.5 miles	Forest System Trail – motorized & nonmotorized
Stonewall Mountain Trail #418	2.5 miles	Forest System Trail – motorized & nonmotorized
Stonewall Trail #417	3 miles	Forest System Trail – motorized & nonmotorized
Snowmobile Trails	**Miles within Stonewall Project Area**	**Trail type (groomed/ungroomed)**
Route 2, Beaver-Dry Creek Trail	7 miles	Groomed
Route 1, Sucker Creek Road	1 mile	Groomed
Stonewall Mountain Trail	3 miles	Ungroomed
Trail near Reservoir Lake	1 mile	Ungroomed

The Lincoln Ranger District is currently developing the *Blackfoot Travel Plan (non-winter)* that would designate motorized public access routes on a Motor Vehicle Use Map. The recently completed *Blackfoot-North Divide Winter Travel Plan* provides for a variety of motorized and nonmotorized winter recreational opportunities. The travel plans are being developed in accordance with 36 CFR 212, Subpart B, *Designation of Roads, Trails, and Areas for Motor Vehicle Use.*

Recreation Opportunity Spectrum

The Forest Service uses the Recreation Opportunity Spectrum (ROS) to inventory and describe the range of recreation opportunities available based on the following characteristics of an area: physical (characteristics of the land and facilities), social (interactions and contact with others), and managerial (services and controls provided). The recreational settings are described on a continuum ranging from Primitive to Urban. The Summer ROS classes within the Stonewall Project area include Semi-Primitive Motorized (SPM) and Roaded Modified (RM) (figure 114). The Winter ROS classes within the Stonewall

[35] The groomed trails are as indicated on the Lincoln Area Snowmobile Trails Map compiled by the Ponderosa Snow Warriors Snowmobile Club (available in the project record)

project area include Semi-Primitive Motorized (SPM), Roaded Natural (RN), and Roaded Modified (RM) (figure 115). The Helena Forest Plan includes the following ROS Class definitions:

Semi-Primitive - A classification of recreation opportunity spectrum that characterizes a predominately natural or natural appearing environment of a moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but subtle. In areas designated as **Semi-Primitive Motorized**, motorized use may occur on primitive roads and motorized trails.

Roaded Natural - A classification of the recreation opportunity spectrum where timber harvest or other surface-use practices are evident. Motorized vehicles are permitted on all parts of the road system (USDA Forest Service 1986).

Roaded Modified - A subclass of **Roaded Natural** that has typically been defined as areas exhibiting evidence of Forest management activities that are dominant on the landscape (USDA Forest Service 2003).

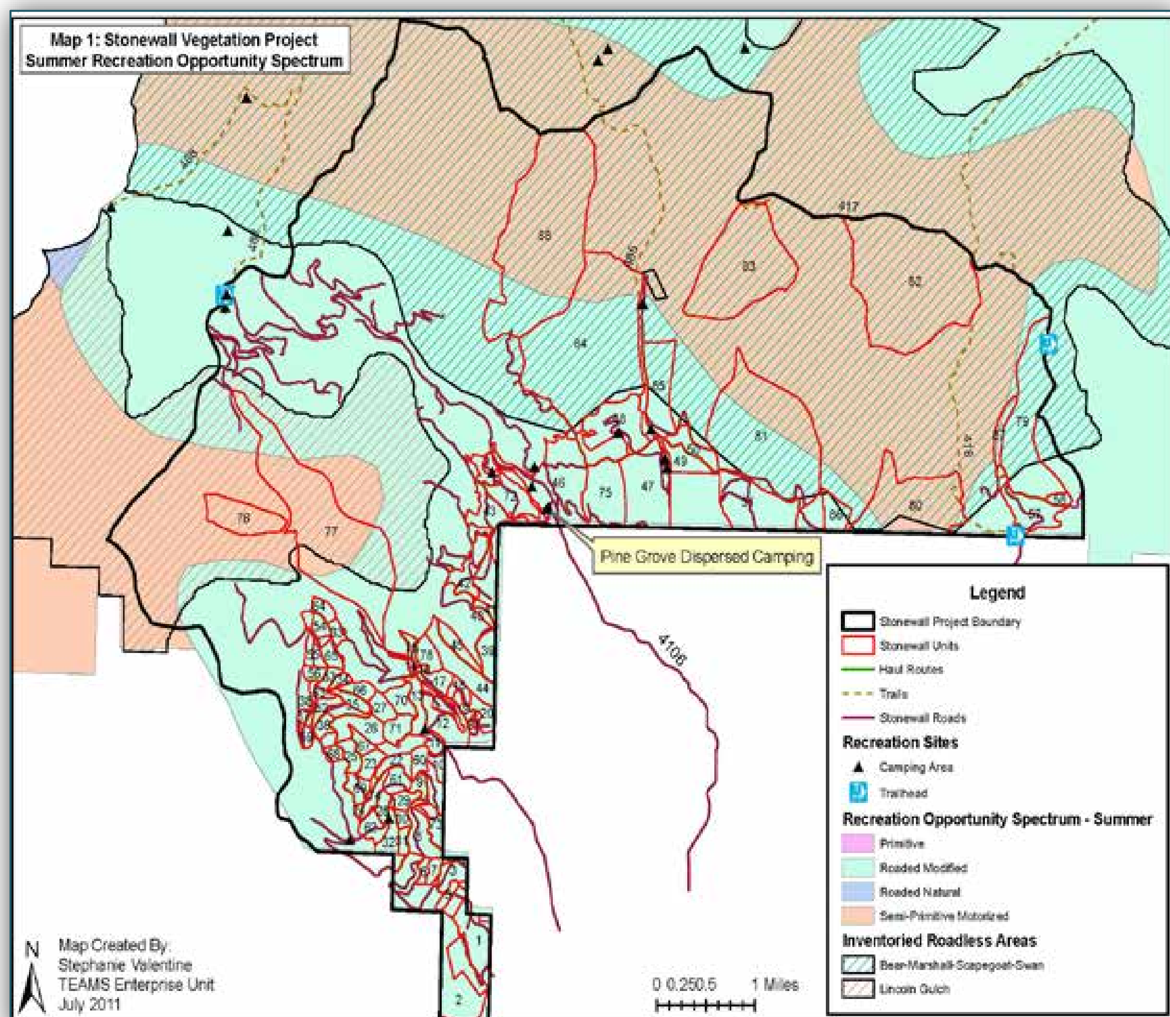


Figure 114. Summer Recreation Opportunity Spectrum

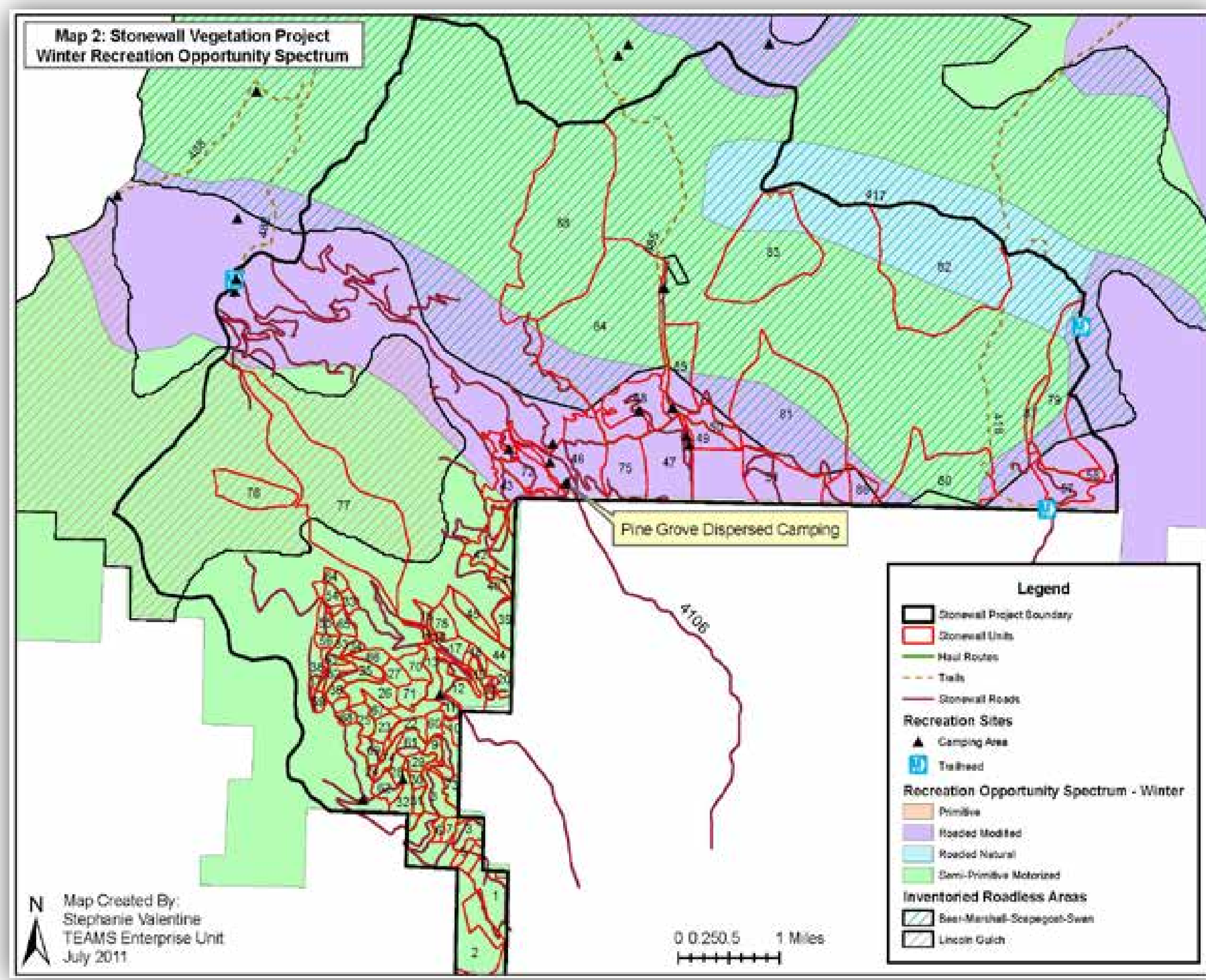


Figure 115. Winter Recreation Opportunity Spectrum

Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

If the no-action alternative is chosen, there would be no direct effects from proposed activities to recreation resources. However, the risk of severe wildfire would remain because the ecosystem restoration and fuel reduction project would not occur. In the long term, this may result in indirect effects to recreation resources, potentially resulting in changes to the recreation setting or scenic quality of the project area. The beetle killed, dead and dying trees would eventually fall to the ground making cross-country foot travel more difficult for hunting and hiking. In the long-term, this may result in displaced users as trees fall across trails and visitors find other places to hunt, hike and walk. The effects to the recreation resource would continue over the next 10 to 15 years as dead trees fall to the ground and vegetation begins to reestablish.

Cumulative Effects

There are no known cumulative effects to recreation resources from alternative 1.

Irreversible and Irretrievable Commitments of Resources

Alternative 1 would have no irreversible and irretrievable commitments of resources relevant to the recreation resources within the project area.

Alternative 2 – Proposed Action

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to recreation and other resources is displayed in table 9, chapter 2.

The specific design features listed in table 9 pertaining to recreation are REC-1 through REC-8.

This analysis is based on the implementation of all design features. Project design features apply to all action alternatives.

Direct and Indirect Effects

Activities from the proposed vegetation treatments including regeneration harvest, intermediate harvest, precommercial thinning, and prescribed burning may directly affect recreation activities and experience in the project area. The vegetation treatments may require roads built then obliterated, or trail closures, or limited access to the immediate area to protect public safety. In addition, visitors may choose to avoid areas during the harvesting, hauling, or prescribed burning activities. These effects would be both temporary and short term. The project design features listed in table 9 in chapter 2, minimize project activities during hunting season and limit hauling on weekends and holidays (see Rec-1 and Rec-2) and would minimize impacts to the majority of recreational users. Public notification at trailheads, on the Forest website and in the local media would allow adequate notice for those planning trips into the area to adjust their plans (Rec-3). Commercial outfitters operating in the area during project implementation may also be directly affected by limited access or trail closures. The public notification efforts would allow them to adjust their schedules.

The proposed vegetation treatments may indirectly affect the recreation setting within the project area by changing the scenic qualities within the treatment areas. The harvest activities would reduce stand density, and the cut tree stumps would remain visible to visitors passing through the project area. The prescribed burning activities would create blackened areas on the landscape. These effects would be short term.

The long-term benefits of the proposed action, including a more diverse, resilient and sustainable forest ecosystem, and reduction in the risk of negative impacts from severe wildfire or insects and disease, have the potential to indirectly benefit recreation by helping to maintain the settings and opportunities currently valued by the public for recreation within the project area. Studies suggest that less intense fires may have beneficial economic effects on outdoor recreation, whereas intense fires may have detrimental effects (Vaux, Gardner and Mills 1984).

Regeneration Harvest, Intermediate Harvest, Precommercial Thinning

The direct impacts to recreation from the harvest activities would be to the sights and sounds of equipment including chainsaws, feller bunchers, and cable logging equipment within the harvest units, and log truck traffic on the haul routes. Indirect affects to recreation would result from changes to the scenery following the harvest activities

Removal of beetle-killed trees would reduce the amount of standing dead trees that would eventually fall. The harvest activities would reduce safety concerns and make cross-country travel by foot easier for dispersed recreational activities such as hunting and hiking.

The Pine Grove dispersed camping area and trailhead is located within unit 46, which is proposed for intermediate harvest to restore open habitat, leaving a mature forest and the largest trees behind. After treatment, trees would be spaced 20 to 40 feet apart. This would result in short-term effects to recreation opportunities during the harvest activities, but the more open forest conditions would likely enhance opportunities for dispersed camping in the long term. A proposed haul route would also pass through this dispersed camping area. Project design features are in place to minimize impacts to the dispersed camping opportunities. They include prioritizing treatments adjacent to the dispersed camping area to limit the amount of time the area may be closed to the public, not permitting hauling on weekends and holidays, providing public notification of treatment schedules and protecting recreation facilities (See table 9, REC-2, 3, 5, 6, 7 and 8).

Several of the groomed snowmobile routes have been identified as haul routes for the harvest activities. Approximately 3 miles of Route 2 - Beaver-Dry Creek Trail (along Roads 4106 and 607), approximately 4 miles of Route 2A – Beaver Trail (not on Forest System land, along Road 4106) and approximately 4 miles of Route 1 – Sucker Creek Road Trail (along Road 1800, 3 miles, not on Forest System land), would be used as haul routes. Route 2 passes through units 46, 47 and 51 and runs along the borders of units 75, 48, 49, and 50 proposed for intermediate harvest or precommercial thinning. The 1-mile segment of Route 1 on Forest System land is located within unit 57 where the mountain pine beetle has caused high mortality. This unit is proposed for regeneration harvest that would leave behind live trees to provide shelter and seed, and establish a new stand of young trees. The Forest would coordinate with local snowmobile groups to identify alternative routes if winter operations would affect the use of the groomed trails (See table 9, REC-4).

Skid trails left by ground-based harvest and removal methods may open access to areas for off highway vehicles where vegetation previously prevented access. Design features are in place to minimize the appearance of skid trails where they intersect with existing roads and trails to reduce the likelihood of unauthorized motorized use (See table 2, Fuel-3). The ongoing *Blackfoot Travel Plan (non-winter),* under analysis, and the recently completed *Blackfoot – North Divide Winter Travel Plan*, would designate public motorized access and motorized and nonmotorized recreational opportunities on the Lincoln Ranger District. The Stonewall Vegetation Project proposed action would not change any motorized route designations. A portion of the project area is open to cross-country travel by snowmobiles; the creation of more open forest conditions that would result from implementation of the proposed action could enhance the opportunities for snowmobiling within the project area. The Lincoln Ranger District Helena National Forest Over-The-Snow Motor Vehicle Use Map Valid December 2, 2014 – December 1, 2015, shows the areas open to cross-country travel by snowmobiles areas where snowmobile use is restricted to designated routes, and the groomed and ungroomed snowmobile trails within the Stonewall Project area.

Following the vegetation treatments, opportunities for firewood gathering would be enhanced (see table 9, FUEL-1). Huckleberries may see an increase in regeneration, therefore, picking opportunities may be fewer in the short term following treatments, but enhanced in the long term as plants start to reestablish (see the Wildlife Specialist Report (Reitz 2012) for additional information).

Prescribed Burning

The direct impacts to recreation from the prescribed burning activities during project implementation would be the sights and sounds of people and equipment, including chainsaws and vehicles, and smoke in the air. Smoke in the air during the prescribed burns may have a direct affect to the quality of the recreation experience within the project area and in the adjacent dispersed camping areas by temporarily reducing air quality and visibility. Coordination with the Montana Airshed Group to ensure compliance with the Clean Air Act would minimize this impact (see table 9 AIR-1 and additional discussion in the Air Quality Report (USDA Forest Service 2015d).

Indirect affects to recreation would result from changes to the scenery following the prescribed burning activities.

There is potential for prescribed fire to affect Forest System trails by causing increased runoff and erosion or debris on the trails. There may be an increased incidence of burnt trees falling across the trails for several years following the prescribed burns. The Stonewall Mountain Trail #418 runs along the eastern boundary of units 80 and 82. The Stonewall Trail #417 runs along the northern boundary of the project area and units 82 and 83. The Stonewall/Copper Creek Trail #485 runs along the western boundary of unit 85 and passes through the eastern edge of unit 84. All of these units are proposed for prescribed burning activities. The designated National Forest System trails on the Lincoln Ranger District receive regular maintenance. Specific trail maintenance requirements would be addressed as needed based on trail conditions.

The proposed prescribed fire activity would include construction of hand fire lines. The fire lines may open access for OHVs where vegetation previously prevented access. Design features are in place to minimize the appearance of fire lines where they intersect with existing trails to reduce the likelihood of unauthorized use (see table 9, FUEL-3). The recently completed Blackfoot winter and the ongoing analysis of the Blackfoot summer travel plans, discussed previously, when completed would guide motorized access on the Lincoln Ranger District. The proposed action would not change any motorized route or area designations.

Recreation Opportunity Spectrum

A majority of the proposed treatment units fall within the summer and winter ROS classes of Roaded Modified, while the only treatment proposed within the Semi-Primitive Motorized ROS class is hand slashing of small diameter trees and prescribed fire. The proposed harvest and prescribed burning activities, including the short-term disturbance, would be consistent with Roaded Natural and Roaded Modified ROS classes where timber harvest or other surface use practices are evident. The proposed hand slashing of small diameter trees and prescribed fire would maintain a predominately natural or natural appearing environment and would be consistent with Semi-Primitive Motorized ROS class. There are no anticipated long-term effects on recreation opportunities or settings for the Stonewall Project area under alternative 2. Table 176 that follows shows the units and treatments proposed with potential impacts to specific recreation resources:

Table 176. Alternative 2 – proposed treatments and potentially impacted recreation resources

Unit Number	Alternative 2 – Proposed Action Treatment Description	Potentially Impacted Recreation Resource
46	Description Group 1 - Intermediate Harvest to Promote Mature Open Forests; Prescribed Fire - Underburn	Pine Grove Dispersed Camping & groomed snowmobile route (2)
47	Description Group 1 - Intermediate Harvest to Promote Mature Open Forests; Prescribed Fire - Underburn	Groomed snowmobile route (2)
48	Description Group 2 - Intermediate Harvest to Thin Young Forests; Underburn	Groomed snowmobile route (2)
49	Description Group 2 - Intermediate Harvest to Thin Young Forests; Underburn or slash treatment along private	Groomed snowmobile route (2)

Unit Number	Alternative 2 – Proposed Action Treatment Description	Potentially Impacted Recreation Resource
50	Description Group 2 - Intermediate Harvest to Thin Young Forests; No fuels treatment	Groomed snowmobile route (2)
51	Description Group 2 - Intermediate Harvest to Thin Young Forests; Underburn or slash treatment along private	Groomed snowmobile route (2)
57	Description Group 3 - Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees; Jackpot Burn	Groomed snowmobile route (1), adjacent to trailhead #418, Stonewall Mountain Trail
75	Description Group 2 - Intermediate Harvest to Thin Young Forests; Underburn	Groomed snowmobile route (2)
80	Description Group 7 - Mixed Severity Fire to Create Mortality Patches up to 5, 10, or 20 Acres	Trail #418, Stonewall Mountain Trail
82	Description Group 8 - Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Trail #417 - Stonewall Trail , #418 - Stonewall Mountain Trail
83	Description Group 8 - Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Trail #417 - Stonewall Trail
84	Description Group 8 - Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Trail #485 - Stonewall/Copper Creek Trail
85	Description Group 6 - Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 Acres	Trail #485 - Stonewall/Copper Creek Trail

Irreversible and Irretrievable Commitment of Resources

In alternative 2, proposed action, there would be no irreversible and irretrievable commitment of resources relevant to the recreation resources within the project area.

Alternative 3

The activities proposed in alternative 3 differ from those of alternative 2 - proposed action, relevant to the analysis of recreation resources. The relevant changes include fewer units proposed for intermediate harvest and fewer units proposed for prescribed fire and hand slashing of small diameter trees within inventoried roadless areas (IRAs). Alternative 3 has no activities planned within the Lincoln Gulch IRA or in the unroaded area contiguous to this IRA. In addition, alternative 3 proposes fewer units for treatment in the Bear-Marshall-Scapegoat-Swan IRA.

The relevant unit changes in alternative 3 are as follows:

Units 46 and 47 change from intermediate harvest with underburn treatments in Group 1 for alternative 2, to units 46a and 47a in a new group, Group 10 for alternative 3. Treatments would be designed in a mosaic pattern to maintain cover and forage for wildlife while promoting ponderosa pine and aspen, and reducing ladder fuels. Portions of the stand would be thinned to reduce understory competition from around large ponderosa pine trees, thin heavily stocked groups of trees on sites historically dominated by ponderosa pine, and remove conifer competition from within and around quaking aspen.

Units 49 and 75 proposed for intermediate harvest are removed. Units 76 and 77 proposed for prescribed fire are removed from the Lincoln Gulch IRA and the unroaded area contiguous to the IRA. The mixed severity prescribed fire proposed for unit 80 changes to unit 80a, jackpot burn. Units 81 and 86 proposed for mixed severity prescribed fire are removed from the Bear-Marshall-Scapegoat-Swan IRA and the unroaded area contiguous to the IRA.

Direct and Indirect Effects

Regeneration Harvests, Intermediate Harvests, Precommercial Thinning

The Pine Grove dispersed camping area and trailhead is located within unit 46a proposed for intermediate harvest with jackpot burning in alternative 3. There would be short-term impacts to recreation opportunities during these activities, but the more open forest conditions would likely enhance opportunities for dispersed camping in the long term. A proposed haul route would also pass through this dispersed camping area. Project design features are in place to minimize impacts to the dispersed camping opportunities. They include prioritizing treatments adjacent to the dispersed camping area to limit the amount of time the area may be closed to the public, not permitting hauling on weekends, providing public notification of treatment schedules and protecting recreation facilities (see table 9, REC-2, 3, 5, 6, 7 and 8).

Several of the groomed snowmobile routes have been identified as haul routes for the harvest activities. Approximately 3 miles of Route 2 - Beaver-Dry Creek Trail (along Roads 4106 and 607), approximately 4 miles of Route 2A – Beaver Trail (not on Forest System land, along Road 4106) and approximately 4 miles of Route 1 – Sucker Creek Road Trail (along Road 1800, 3 miles, not on Forest System land), would be used as haul routes. Route 2 passes through units 46a, 47a and 51 and runs along the borders of units 48, and 50 proposed for intermediate harvest or precommercial thinning. Alternative 3 would have slightly less potential to impact Route 2, since two of the units proposed for treatment (75 and 49) were removed from consideration in this alternative. The 1-mile segment of Route 1 on Forest System land is located within unit 57 where the mountain pine beetle has caused high mortality. This unit, proposed for regeneration harvest, would leave behind live trees to provide shelter and seed to establish a new stand of young trees. The Forest would coordinate with local snowmobile groups to identify alternative routes if winter operations would affect the use of the groomed trails (See table 9, REC-4).

Prescribed Burning

Alternative 3 proposes fewer acres of prescribed burning; therefore, the potential impacts of noise from people and equipment would be less than those described in alternative 2. Smoke in the air during the prescribed burns may have a direct affect to the quality of the recreation experience within the project area and in the adjacent dispersed camping areas by temporarily reducing air quality and visibility. Coordination with the Montana Airshed Group to ensure compliance with the Clean Air Act would minimize this affect (see table 9, AIR-1 and additional discussion in the Air Quality section).

Indirect affects to recreation would result from changes to the scenery following the prescribed burning activities, but fewer changes can be expected in this alternative compared to alternative 2 because fewer acres are proposed for treatment.

There is potential for prescribed fire to affect Forest System trails by causing increased runoff and erosion or debris on the trails. There may be an increased incidence of burnt trees falling across the trails for several years following the prescribed burns. The Stonewall Mountain Trail #418 runs along the eastern boundary of units 80a and 82. The Stonewall Trail #417 runs along the northern boundary of the project area and units 82 and 83. The Stonewall/Copper Creek Trail #485 runs along the western boundary of unit 85 and passes through the eastern edge of unit 84. All of these units are proposed for prescribed burning activities. The designated National Forest System trails on the Lincoln Ranger District receive regular maintenance. Specific trail maintenance requirements would be addressed as needed based on trail conditions.

Recreation Opportunity Spectrum

A majority of the proposed treatment units fall within the summer and winter Recreation Opportunity Spectrum classes of Roaded Modified, while the only treatment proposed within the Semi-Primitive Motorized ROS class is hand slashing of small diameter trees and prescribed fire. The proposed harvest and prescribed burning activities, including the short-term disturbance, would be consistent with Roaded Natural and Roaded Modified ROS classes where timber harvest or other surface-use practices are evident. The proposed hand slashing of small diameter trees and prescribed fire would maintain a predominately natural or natural appearing environment and would be consistent with Semi-Primitive Motorized ROS class. There are no anticipated long-term effects on recreation opportunities or settings for the Stonewall Project area under alternative 3.

Table 177 that follows shows the units and treatments proposed with potential impacts to specific recreation resources:

Table 177. Alternative 3 – proposed treatment and potentially impacted recreation resources

Unit Number	Alternative 3 –Treatment Description	Potentially Impacted Recreation Resource
46a	Description Group 10 – Intermediate Harvest – Improvement Cut; Jackpot burn, Handpiling, Burn Piles	Pine Grove Dispersed Camping & groomed snowmobile route (2)
47a	Description Group 10 - Intermediate Harvest to Thin Young Forests; Low Severity Prescribed Fire	Groomed snowmobile route (2)
48	Description Group 2 - Intermediate Harvest to Thin Young Forests; Underburn	Groomed snowmobile route (2)
50	Description Group 2 - Intermediate Harvest to Thin Young Forests; No fuels treatment	Groomed snowmobile route (2)
51	Description Group 2 - Intermediate Harvest to Thin Young Forests; Underburn or slash treatment along private	Groomed snowmobile route (2)
57	Description Group 3 - Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees; Jackpot Burn	Groomed snowmobile route (1), adjacent to trailhead #418 - Stonewall Mountain Trail
80a	Description Group 9 - Low Severity Prescribed Fire	Trail #418 - Stonewall Mountain Trail
82	Description Group 8 - Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Trail #417 - Stonewall Trail, #418 - Stonewall Mountain Trail
83	Description Group 8 - Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Trail #417 - Stonewall Trail
84	Description Group 8 - Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Trail #485 - Stonewall/Copper Creek Trail
85	Description Group 6 - Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 Acres	Trail #485 - Stonewall/Copper Creek Trail

Irreversible and Irretrievable Commitments of Resources

In alternative 3, there would be no irreversible and irretrievable commitment of resources relevant to the recreation resources within the project area.

Cumulative Effects Common to All Action Alternatives

Cumulative effects to recreation within the Stonewall Project area boundary would relate to other administrative or Forest management activities occurring within or immediately adjacent to the project area. Cumulative impacts would result if other activities take place during implementation of the

Stonewall Vegetation project or until vegetation growth obscures the visible stumps from the vegetation treatment activities and prescribed fire, approximately 3-5 years.

The effects of past actions within the Stonewall Project area are incorporated into the description of the existing condition. The present and reasonably foreseeable future actions within the project area have been reviewed for potential cumulative effects when the direct or indirect effects of the alternatives are added to them. The projects occurring within the spatial and temporal boundaries described in this analysis for recreation resources cumulative effects analysis are considered here.

Since there would be no direct or indirect effect to the ROS classes, there would be no cumulative effects to the ROS classes within the project area.

Recreational activities such as hunting, camping, hiking, OHV travel on primitive roads, and snowmobiling and cross-country skiing in the winter would continue within the analysis area. Other ongoing and reasonably foreseeable activities that would be occurring within the analysis area include hazard tree removal, weed treatments, road and trail maintenance, commercial guided recreation and special events, firewood cutting and continued use of grazing allotments. All of these activities, when added to the activities proposed in the Stonewall Vegetation Project have the potential to cumulatively affect the recreation experience within the project area. The primary impacts would be due to the increased presence of people, vehicles and associated noise that would directly affect the ability of recreational visitors to enjoy their desired experience, and may lead to the short-term displacement of visitors who choose to avoid the area during implementation of the various activities.

The longer-term impacts of ongoing and reasonably foreseeable activities, such as hazard tree removal and weed treatments, when added to the activities proposed in the Stonewall Vegetation project, have the potential to cumulatively impact the recreation setting by causing changes to the scenic qualities within the project area and creating a setting where resource modifications and utilization practices are evident, but harmonize with the natural environment as indicated in a Roaded Natural ROS setting (p.5). Most of these effects would be beneficial because they would increase the resiliency of forest conditions, and reduce the risk of potential negative impacts from severe wildfire, therefore, maintaining the recreation settings currently valued by the public.

A complete list of past, present and reasonably foreseeable future activities in the project area is in appendix C.

Summary of Effects of All Alternatives

Alternative 1, no action would have no direct or cumulative effects to recreation resources. The purpose and need for the Stonewall Vegetation Project *"…improving the mix of vegetation and structure across the landscape so that it is diverse, resilient, and sustainable to wildfire and insects; modifying fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape; enhancing and restoring aspen, western larch and ponderosa pine species and habitats; utilizing the economic value of trees through removal; and integrating restoration with socioeconomic considerations"* would not be addressed. Potential long-term indirect effects to recreation resources would be due to the ongoing risk of severe wildfire that could lead to changes in the recreation settings, visual qualities and naturalness within the roadless expanse.

Alternative 2, proposed action would have short-term direct effects to recreation resources during project implementation such as limited access to specific areas and increased presence of people and noise within the project area. Project design features are in place to limit potential affects (table 9). The proposed treatments would address the purpose and need for the Stonewall Vegetation Project, resulting in a more diverse, resilient and sustainable Forest ecosystem with reduction in risk of negative impacts from severe wildfire. The long-term indirect effects to recreation would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area.

Cumulative effects to recreation resources would generally be short term, occurring during project implementation, and would relate to an increased presence of people, vehicles and the associated noise that may affect the recreation experience. Longer-term cumulative effects would potentially impact the Pine Grove dispersed camping area, such as ongoing hazard tree removal, weed treatments, and ongoing maintenance and use of the site, in addition to the actions proposed in the Stonewall Vegetation Project. These effects would remain until vegetation growth obscures the visible stumps from the vegetation treatment activities, approximately 3-5 years, but would remain consistent with Roaded Natural ROS class.

The effects of alternative 3 relative to recreation resources would be similar to those described for alternative 2, but the impacts would occur on fewer acres. There would be no affects to the Lincoln Gulch IRA and fewer acres treated within the Bear-Marshall-Scapegoat-Swan IRA (see the Inventoried Roadless Area Report (Valentine 2015a) for additional analysis).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed alternatives are consistent with the following:

- Helena National Forest Plan 1986, Recreation Standards for Management Areas: M-1, T-1, T-2, T-3, T-4, and W-1.

Forest Service Manual (FSM) 2300 – Recreation, Wilderness and Related Resource Management, guides management of recreation and wilderness resources on National Forest System lands.

Inventoried Roadless Areas

Introduction

This analysis describes the existing condition in portions of the Bear-Marshall-Scapegoat-Swan (BMSS) and Lincoln Gulch Inventoried Roadless Areas (IRAs) that are within the Stonewall Vegetation Project area. In addition, this roadless analysis describes the potential effects from the proposed activities identified in the alternatives of the Stonewall Project to the roadless area characteristics and wilderness attributes of the Inventoried Roadless Areas, as well as the unroaded lands contiguous to them. Additional detailed information is contained in the Inventoried Roadless Area report (Valentine 2015a), incorporated by reference.

Overview of Issues Addressed

During the public scoping process, five comments were received regarding IRAs. The comments were identified as nonsignificant (40 CFR 1501.7). Specific responses to the comments and explanations of how the comments were addressed either in the analysis or through project design features, are included in this DEIS in Appendix A – Public Involvement.

The following issue is relevant to the roadless resources within the analysis area and is addressed by the analysis in this section:

- Prescribed fire activities may affect roadless area characteristics within the project area.

Indicators

Indicators are defined to analyze data regarding the potential for impacts to the roadless resource from project activities that may affect roadless characteristics and wilderness attributes. Impacts to the roadless area characteristics as described in 36 CFR 294.11 – Roadless Area Conservation, Final Rule and wilderness attributes of roadless areas as described in Forest Service Handbook (FSH) 1909.12 (72.1) – Wilderness Evaluation.

Measure: Acres affected and duration of the impact

Roadless Analysis Background and Direction

Classification of roadless areas began with the Roadless Area Review and Evaluation (RARE) study in 1973 and the subsequent RARE II study in 1978. The 1983 Helena Forest Plan included evaluation of 23 roadless areas (USDA Forest Service 1986c, FEIS ROD). This met the direction in 36 CFR 219.17 regarding evaluation of roadless areas, and was in compliance with a 1982 decision of the Ninth Circuit Court that found RARE II study to be inadequate. As a result of this evaluation, the Forest Plan provides management direction for 79,200 acres of undeveloped area outside of Wilderness to remain undeveloped, and the remaining 203,900 acres of undeveloped areas were assigned to other resource management goals (USDA Forest Service 1986b, c). The two IRAs within the Stonewall Project area (Bear-Marshall-Scapegoat-Swan and Lincoln Gulch) were among those areas assigned to other resource management goals, as described in the Affected Environment section of this section.

On Jan 12, 2001, the Roadless Area Conservation Rule was published (36 CFR 294); the rule became effective on March 13, 2001. The 2001 rule prohibited road construction, road reconstruction and timber cutting, sale and removal in inventoried roadless areas with some exceptions. On July 13, 2003, the 2001 Roadless Rule was enjoined by U.S. District Court Judge Brimmer in Wyoming, after which the Forest Service established Interim Directives for the management of roadless areas.

In May 2005, the 2005 State Petitions Rule was established, which allowed governors to petition for individual, state-specific rules to manage IRAs in national forests and grasslands in their states. In October 2006, Judge Laporte (Northern District Court of California) set aside the State Petitions Rule and reinstated the 2001 Roadless Rule (*California ex rel. Lockyer v USDA).* In December 2008, the Court limited its injunction to states within the Ninth Circuit and New Mexico (excluding Idaho). In August 2009, the 9th Circuit Court of Appeals affirmed the Northern District Court of California’s opinions.

On Jan 12, 2007, the state of Wyoming again challenged the 2001 Roadless rule in Wyoming. On August 12, 2008 in the District Court of Wyoming, Judge Brimmer issued a ruling enjoining the 2001 Roadless Rule for the second time *(Wyoming v. USDA).* This opinion was appealed to the 10th Circuit Court of appeals.

On May 28, 2009, Secretary of Agriculture Tom Vilsack issued Memorandum 1042-154, which reserves “to the Secretary the authority to approve or disapprove road construction or reconstruction and the cutting, sale, or removal of timber in those areas identified in the set of inventoried roadless area maps contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000.” The Secretary's Memorandum 1042-154 is intended to assure careful evaluation of actions in inventoried roadless areas while long-term roadless policy is developed and relevant court cases move forward.

On August 3, 2009, the Forest Service received re-delegation of authority from the Secretary to authorize

- Approval of any necessary timber cutting or removal or any road construction/reconstruction in emergency situations involving wildfire suppression, search and rescue operations, or other imminent threats to public health or safety in Inventoried Roadless Areas. The local line officer is delegated authority to make these decisions.
- Approval of any timber cutting, sale, or removal in inventoried roadless areas incidental to the implementation of an existing special use authorization. Road construction/ reconstruction are not authorized through this re-delegation without further project-specific review. The local line officer is delegated authority to make these decisions.

On October 16, 2009, the Secretary re-delegated authority to the Forest Service for the cutting, sale, or removal of generally small diameter timber when needed for one of the following purposes:

- To improve threatened, endangered, or sensitive species habitat
  a. To maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period
  b. For administrative and personal use, as provided for in Title 36, Code of Federal Regulations 223, where personal use includes activities such as Christmas trees and firewood cutting and where administrative use includes providing materials for activities such as construction of trails, footbridges, and fences

On May 28, 2010 and again on May 30, 2011, Secretary Thomas J. Vilsack renewed his reservation of final decision authority over certain forest management and road construction projects in inventoried roadless areas. The new Secretary's Memorandum 1042-155 and 1042-156 include the same re-delegations of authority to the Forest Service as described above.

On October 21, 2011, the United States Court of Appeals for the Tenth Circuit decided *Wyoming v. USDA* and found the Forest Service's adoption of the 2001 Roadless Area Conservation Rule (Roadless Rule) does not violate Federal law. The Tenth Circuit ordered the District of Wyoming Court to vacate its earlier ruling and lift its nationwide injunction of the Roadless Rule. Pending action by the District Court to vacate the permanent injunction, the Forest Service continued to follow the direction in the letter dated August 18, 2008 signed by the Deputy Chief for NFS (see Holtrop 2008) and the direction provided in the Secretary's Memo 1042-156, described in Pena (2011).

On March 2, 2012, Judge Brimmer (Wyoming) lifted his injunction on the 2001 Roadless Rule. Lifting the injunction paves the way for implementation of the 2001 Roadless Rule nationwide, and in Region 1 (except for Idaho) provides much needed consistency regarding the management of Inventoried Roadless Areas.

On May 30, 2012, the Secretary's Memorandum 1042-156 requiring review and approval of certain activities in Roadless Areas expired. In order to provide a smooth transition, the Chief is requiring review of certain activities (see Chiefs Letter dated May 31, 2012, and the associated attachments describing the Review Process, and Talking Points. Some activities will require review by the Chief and others by the Regional Forester. In Region 1, the Regional Forester review process has been delegated to Deputy Regional Forester Jane Cottrell, per the Regional Forester's letter dated June 8, 2012.

The Chief's letter dated May 31, 2012 implements the following process for review of certain activities in Roadless Areas:

Except as noted below, the Chief will review all projects involving road construction or reconstruction and the cutting, sale, or removal of timber in those areas identified in the set of inventoried roadless area maps contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement Volume 2 dated November 2000.

Regional Foresters will review the following activities:

a. Any necessary timber cutting or removal or any road construction or road reconstruction in emergency situations involving wildfire suppression, search and rescue operations, or other imminent threats to public health and safety in inventoried roadless areas.
b. Timber cutting, sale, or removal in inventoried roadless areas incidental to the implementation of an existing special use authorization. Road construction or road reconstruction is not authorized through this re-delegation without further project-specific review.
c. The cutting, sale, or removal of generally small diameter timber when needed for one of the following purposes:
    1) To improve threatened, endangered, proposed, or sensitive species habitat;
    2) To maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period; or,
    3) For the administrative and personal use, as provided for in 36 CFR 223, where personal use includes activities such as Christmas tree and firewood cutting and where administrative use includes providing materials for activities such as construction of trails, footbridges, and fences.

The activities proposed within the Stonewall project fall within the activities requiring Regional Forester review, as explained in c. 2, above. To fulfill this requirement, a briefing paper was prepared for the Regional Forester dated November 30, 2009 that included a project description and maps. On February 13, 2012, the Regional Roadless Coordinator reviewed and commented on the Draft Roadless Resource Specialist Report. Additional discussion regarding compliance with the 2001 roadless rule is included in the “Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans” section.

Methodology

An interdisciplinary team meeting and field tour of the proposed project area was attended in Lincoln, Montana by specialists on September 20-24, 2010.

Analysis was accomplished using ArcMap and relevant Geographic Information System (GIS) data layers from the Helena National Forest, Lincoln Ranger District, including trails, roads, recreation sites, inventoried roadless areas, summer and winter ROS classes, winter use, and management areas. On-line visitor information provided by the Helena National Forest and other local organizations was used as an overview of the roadless values and wilderness attributes within the analysis area. A review of existing law, regulation and policy relevant to roadless resources within the project area was conducted and relevant section of the Forest Plan and Forest Service Handbooks are referenced.

Roadless Analysis Methodology

The purpose of the analysis on the roadless resource is to disclose potential effects to roadless area characteristics and wilderness attributes from the Stonewall Project proposed activities, and determine if, or to what extent these effects might influence future consideration for wilderness recommendations. This analysis focuses on the potential effects of project activities on roadless characteristics as defined in 36

CFR 294.11 – Roadless Area Conservation, Final Rule and wilderness attributes as defined in the Forest Service Handbook (FSH) 1909.12 (72.1).

Roadless area characteristics, as defined in 36 CFR 294.11 – Roadless Area Conservation, Final Rule and evaluated in this analysis include the following:

- High quality or undisturbed soil, water, and air
- Sources of public drinking water
- Diversity of plants and animal communities
- Habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land
- Primitive, semi-primitive nonmotorized and semi-primitive motorized classes of dispersed recreation
- Reference landscapes
- Natural appearing landscapes with high scenic quality
- Traditional cultural properties and sacred sites
- Other locally identified unique characteristics

Wilderness attributes, as defined at FSH 1909.12 (72.1) and evaluated in this analysis include the following:

Natural – The extent to which long-term ecological processes are intact and operating

Undeveloped – The degree to which the impacts documented in natural integrity are apparent to most visitors

Outstanding opportunities for solitude or primitive unconfined recreation – Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

Special features and values – Unique ecological, geographical, scenic, and historical features of an area

Manageability – The ability to manage an area for wilderness consideration and maintain wilderness attributes

The following table shows the crosswalk between the wilderness attributes identified in Forest Service Handbook 1909.12 and the 1964 Wilderness Act; and the roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR 294.11).

Table 178. Wilderness attributes and roadless area characteristics crosswalk

Wilderness Attributes	Roadless Area Characteristics
Natural Ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature	High quality or undisturbed soil, water, and air; Sources of public drinking water: Diversity of plant and animal communities; Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; Reference landscapes
Undeveloped Degree to which the area is without permanent improvements or human habitation	Natural appearing landscapes with high scenic quality
Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation Solitude: opportunity to experience isolation from the sights, sounds, and presence of others from the developments and evidence of humans Primitive and unconfined recreation: opportunity to experience isolation from the evidence of humans, to feel a part of nature, to have a vastness of scale, and a degree of challenge and risk while using outdoor skills	Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation
Special Features and Values Capability of the area to provide other values such as those with geologic, scientific, educational, scenic, historical, or cultural significance	Traditional cultural properties and sacred sites; and Other locally identified unique characteristics.
Manageability The ability of the Forest Service to manage an area to meet size criteria and the elements of wilderness	No criteria

Spatial and Temporal Context for Effects Analysis

The potential direct and indirect effects to roadless resources were considered within the Stonewall Project Area boundary. The direct effects would be short term and temporary, occurring during project implementation. The long-term indirect effects would be related to ecosystem restoration, changes in visual qualities, and other items within the project area that would influence several of the areas roadless characteristics.

Cumulative Effects Process

Cumulative effects to roadless resources were considered within the entire 848,097-acre Bear-Marshall-Scapegoat-Swan IRA that is managed by the Helena, Flathead, Lolo, and Lewis and Clark National Forests, the entire 8,247-acre Lincoln Gulch IRA that is managed by the Helena National Forest and unroaded lands contiguous to these IRAs. Potential cumulative effects to roadless resources would be related to other activities occurring within the roadless expanse that have the potential to impact roadless area characteristics or wilderness attributes. Cumulative impacts to roadless resources would result if other activities take place during implementation of the Stonewall Vegetation project, or until vegetation growth obscures the visible stumps from the hand slashing of small diameter trees and hand firelines, approximately 3-5 years.

Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The effects of past actions within the Stonewall Project area are incorporated into the description of the existing conditions. A list of past, present and foreseeable actions relevant to the cumulative effects analysis for roadless resources within the Stonewall analysis area is in volume 2, appendix C. Actions that overlap the roadless areas include:

Helena National Forest, Lincoln Ranger District:

- Helena National Forest Roadside Hazard Tree Removal (completed within the Stonewall project boundary, ongoing within the Bear-Marshall-Scapegoat-Swan IRA)
- Blackfoot Travel Plan (non-winter)
- Alice Creek Wildlife Enhancement Project
- Dry Creek Prescribed Fire
- Southwest Crown Weed Treatments (ongoing)
- Grazing Allotments (ongoing)

Flathead National Forest, Spotted Bear Ranger District:

- Soldier Addition II EA
- Spotted Bear River Project

Lewis and Clark National Forest, Rocky Mountain Ranger District:

- Benchmark Fuels EA
- Rocky Mountain Ranger District Travel Plan EIS, Badger Two Medicine Area
- Rocky Mountain Ranger District Travel Plan EIS, Birch Creek South Area

Lolo National Forest

- Dick Creek Fuels
- Swan Face Prescribed Burn

Affected Environment

Existing Condition

Fire suppression and moist growing conditions through much of this century resulted in a loss of open forest conditions and seral species (aspen, ponderosa pine and western larch). This has created a uniform landscape comprised of dense forests susceptible to insect and wildfire mortality (Douglas-fir and lodgepole pine). In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and ponderosa pine. These conditions are elevating fuel levels, which poses a wildfire threat to nearby homes and communities in the wildland urban interface (WUI).

Inventoried Roadless Areas

The Stonewall Vegetation Project boundary encompasses portions of two IRAs, the Bear-Marshall-Scapegoat-Swan IRA (#A1485) and the Lincoln Gulch IRA (#1601). The portion of the BMSS IRA managed by the Lincoln Ranger District of the Helena National Forest is 51,339 acres in size and the project area overlaps with 12,235 acres. The Lincoln Gulch IRA is 8,247 acres in size and the project area overlaps with 3,193 acres (table 179 and figure 116).

Table 179. Inventoried Roadless Area Acreage

Name of IRA	Total Acres in IRA*	Total Acres in IRA managed by the Lincoln Ranger District	Acres of IRA within the Stonewall Project Boundary	Percent of total IRA acres within the Stonewall Project Boundary
Bear-Marshall-Scapegoat-Swan	848,097	*51,339	12,235	1.4
Lincoln Gulch	8,247	8,247	3,193	38.7
Totals	**856,344**	**59,586**	**15,428**	**1.8**

*Portion of the Bear-Marshall-Scapegoat-Swan IRA managed by the Helena National Forest, Lincoln Ranger District. Total acreage of the Bear-Marshall-Scapegoat-Swan IRA managed by the Flathead, Helena, Lolo and Lewis and Clark National Forests is 866,330 acres (USDA Forest Service 1986, FEIS Appendix C-3).

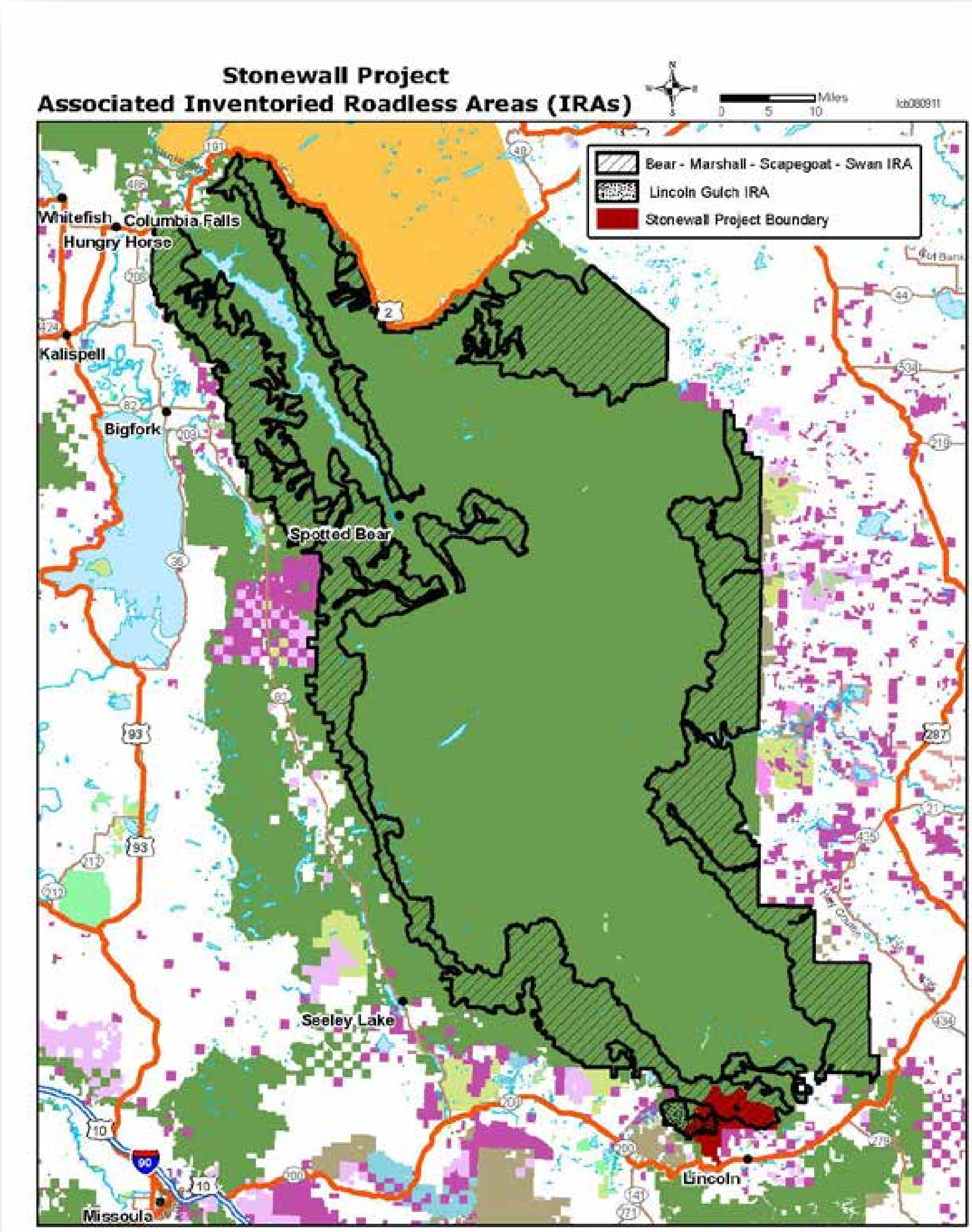


Figure 116. Associated inventoried roadless areas

The Helena National Forest Plan established Forestwide multiple-use goals, objectives, and management area requirements as well as management area prescriptions. Roadless areas are well distributed throughout the Forest and managed to provide semi-primitive recreation opportunities (USDA Forest Service 1986a). The analysis of roadless lands, documented in Appendix C of the FEIS for the Forest Plan, described each roadless area, the resources and values considered, the range of alternative land uses studied, and the effects of management under each alternative (USDA Forest Service 1986b). As a result of the analysis, some roadless areas were recommended for inclusion in the National Wilderness Preservation System and others were assigned various nonwilderness prescriptions. The portion of the BMSS IRA that is within the project area is assigned primarily to Management Area (MA) M1 and W1 with small areas of T1, T3, and T4 along the southern edge of the IRA. The portion of the Lincoln Gulch IRA that is within the project area is assigned primarily to MA T3 with small areas of W1, T1, T2, and M1 (figure 117).

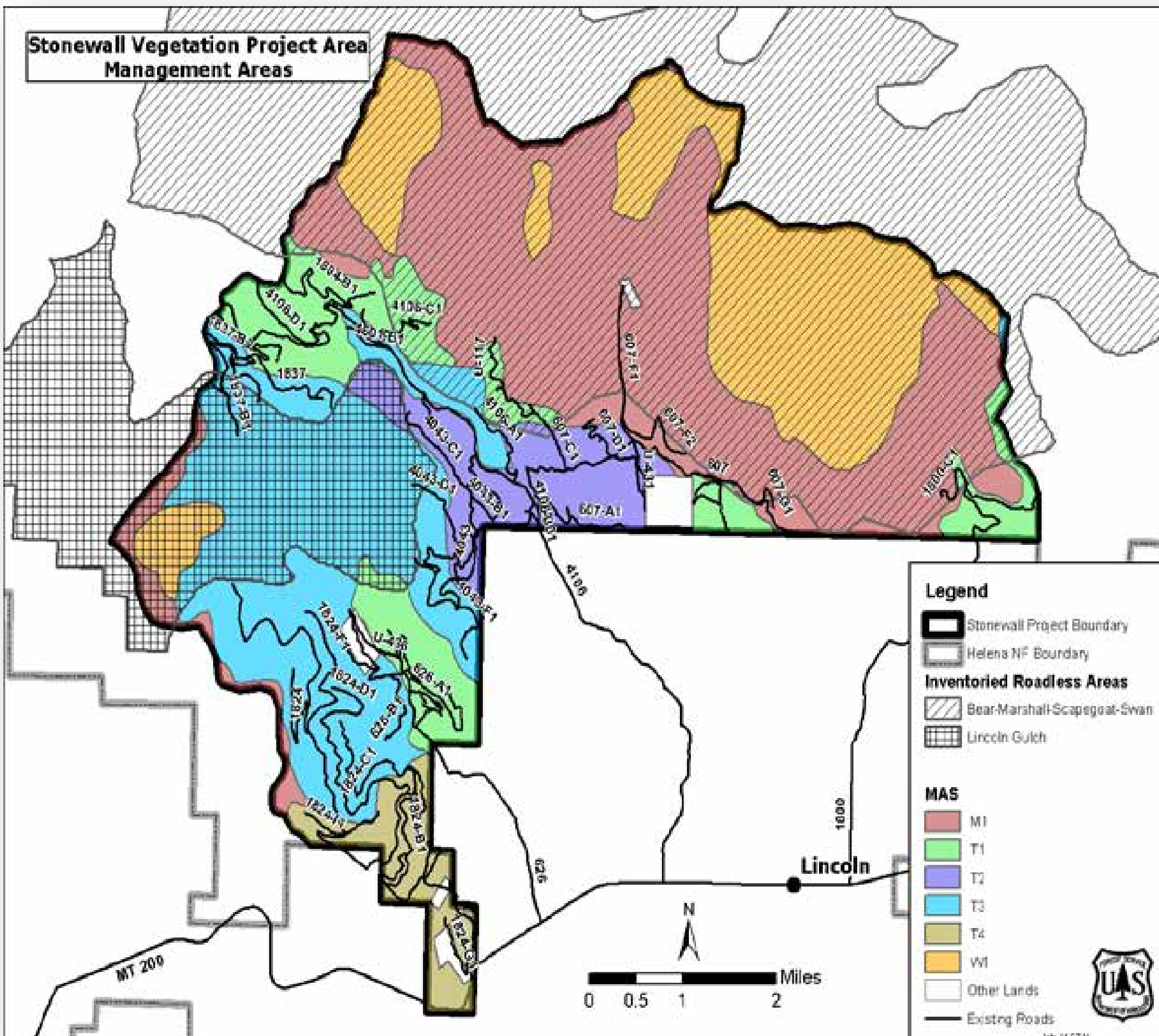


Figure 117. Management areas in the inventoried roadless areas

Bear-Marshall-Scapegoat-Swan IRA

The Bear-Marshall-Scapegoat-Swan Inventoried Roadless Area is located in the Northern Continental Divide Ecosystem. This roadless area surrounds the Bob Marshall, Great Bear and Scapegoat wilderness areas. It also contains portions of the Swan Mountain Range north of the Bob Marshall Wilderness.

The Flathead, Helena, Lolo and Lewis and Clark National Forests manage this large roadless area, which provides habitat for many wildlife species including, grizzly bear and black bear, cougar, lynx, fisher, marten, elk, whitetail deer and mule deer, wolf, moose, mountain goat, and bighorn sheep. The higher elevations provide important summer range habitat for big game species.

The Bear-Marshall-Scapegoat-Swan Inventoried Roadless Area is especially important to many members of the public because of its proximity to other wilderness areas, providing the opportunities for expansive hiking backpacking, hunting, cross-country skiing and equestrian travel. Livestock grazing, motorized recreation, timber harvesting, and oil and gas development represent other uses (USDA Forest Service 1986b, FEIS Appendix C3 – C5).Access to the Scapegoat Wilderness from the south requires travel through the Stonewall portion of this roadless area.

Roadless Area Characteristics

The roadless area encompasses 12 different locations; the Stonewall Mountain area, managed by the Lincoln Ranger District, is located along the southern boundary of the Scapegoat Wilderness. Most of the area west of Stonewall Mountain and Copper Creek is very steep and rocky. The area east of Stonewall Mountain to Copper Creek is steep and well-timbered on north facing slopes. It contains open growing stands of timber with small grassland parks on south and west facing slopes. Elevations range from 4,900 feet in the Blackfoot Valley to 9,411 feet on Red Mountain

Snowmobilers use the Stonewall Mountain Trail to travel to the Upper Copper Creek Basin and use the Alice Creek/ Lewis and Clark Pass area. Most of the drainage bottoms have access trails with the Reservoir Lake Trail in Arrastra Creek receiving the most use (USDA Forest Service 1986b, FEIS Appendix C10-C-11).

Wilderness Attributes

Following is a list of the specific Wilderness Attributes defined in Forest Service Handbook (FSH) 1909.12 (72.1) – Wilderness Evaluation. The Roadless Area Characteristics defined in 36 CFR 294.11 – Roadless Area Conservation, Final Rule are also incorporated into the following descriptions: Wilderness Attributes and Roadless Area Characteristics Crosswalk in the Roadless Analysis Methodology section.

The descriptive paragraphs that follow are from the analysis of roadless lands conducted by the Helena National Forest in 1986 during development of the Forest Plan. Following those paragraphs are descriptions of activities and changes that have occurred since the Forest Plan was developed.

Natural – The extent to which long-term ecological processes are intact and operating

Most of the plant and animal species that existed in this roadless area when the Lewis and Clark Expedition passed south of here nearly 200 years ago are still present. Most mammal species present then are still present now; however, some are considered threatened or endangered. The integrity of the fisheries has been altered by the stocking of grayling and rainbow trout, however, many miles of unaltered cutthroat streams remain. Some invasive plant species, such as spotted knapweed, leafy spurge, thistle, and clover have been introduced accidentally into the area through livestock use. These species are mainly along the trails. Off-trail, the plant community has changed little except for successional changes and those brought about by naturally occurring fires. To the untrained eye, the natural appearance of this area is high (USDA Forest Service 1986b, FEIS Appendix C-11).

Fire suppression and moist growing conditions through much of this century resulted in a loss of open forest conditions and seral species (aspen, ponderosa pine and western larch). This has created a uniform landscape comprised of dense forests susceptible to insect and wildfire mortality (Douglas-fir and lodgepole pine). In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and ponderosa pine.

These vegetative changes have impacted fish and wildlife habitat, and spotted knapweed is present within the IRA, however, the IRA generally continues to provide high quality soil, water and air; diversity of plant and animal communities; and habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land. See additional discussion of the roadless resources in volume 2, appendix D of this DEIS, Stonewall Roadless Characteristics Worksheet and in specific resource sections.

Undeveloped – The degree to which development and uses are apparent to most visitors

Human activities in some areas are evident, although most impacts are concentrated along road corridors and the exterior boundaries. In other areas, the only disruptions are trails, which access the adjacent Wilderness areas (USDA Forest Service 1986b, FEIS Appendix C-11). There is some evidence of non-energy mineral mining exploration that occurred in the Cotter Basin, Copper Camp, Alice Creek and Stonewall Creek areas. Most of this activity lies on the fringes of the area. There are old roads associated with these activities and evidence of past earth moving activities is present. Some clearcuts are in the Alice Creek, Beaver Creek, and Arrastra Creek Drainages, along the edge of the roadless area. Silver King Lookout is the only Forest Service maintained structure in the area. One special use cabin is located in the Alice Creek drainage, as well as fences used for controlling livestock. Seismic exploration has occurred here in recent years (USDA Forest Service 1986b, FEIS Appendix C-21).

Since the 1986 analysis of roadless lands, The Helena National Forest, consistent with Forest Plan direction, has continued harvest and fuels activities within the Bear-Marshall-Scapegoat-Swan IRA, as shown in table 180 that follows. These activities have contributed to some evidence of human access within the IRA; however, the IRA has generally retains the undeveloped characteristics described above.

Table 180. Past harvest and fuel activities since 1986 in the portion of the Bear-Marshall-Scapegoat-Swan IRA managed by the Helena National Forest

Activity	Acres within IRA
Prescribed Burning	5,869
Wildfire	433
Fuels Treatment (yarding, rearranging, piling)	1,587
Thinning (hazardous fuels reduction)	1,551
Range Improvement	871
Timber Harvest (stand clearcut, shelterwood establishment cut, single tree selection cut, sanitation salvage, precommercial thin)	271
Reforestation Needs Created by Fire	1,203
Reforestation/Planting/Regeneration activities	1,657
TOTAL	**13,309**

*Data from “SWCumEffectsPastHarFuActivitiesIRAs_080911.xlsx” Acres rounded for display

Outstanding opportunities for solitude or primitive unconfined recreation – Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

In general, the BMSS IRA possesses high opportunities for solitude because of its size and the influence of the adjacent Bob Marshall, Great Bear and Scapegoat wilderness areas. Much of it contains highly dissected topography that easily screens people from one another in a short distance. Some portions are influenced by adjacent roads and other developments.

The Stonewall area possesses very high opportunities for solitude. Screening of the more developed areas occurs over most of the area. Sounds of vehicles, chainsaws, and logging activity are screened from most of the area due to the topography and lay of the terrain.

The area offers high opportunities for primitive recreation. A variety of topography challenges the visitor with its high mountaintops and steep valleys. The large size of the area offers the opportunity to get away from the man-influenced environment and experience excellent primitive recreation activities such as fishing, camping, hunting, backpacking, hiking, and horseback riding. People nationwide are attracted by the outstanding hunting and backcountry experiences here and in the adjacent wildernesses (USDA Forest Service 1986b, FEIS Appendix C11-12).

The Stonewall area offers a variety of topographic features to challenge the visitor. The high peaks, steep slopes, flat valley bottoms, and numerous streams, offer a different primitive recreation experience to visitors (USDA Forest Service 1986b, FEIS Appendix C-21).

Recreational activities such as hunting, camping, hiking, off-highway vehicle (OHV) travel on primitive roads, and snowmobiling and cross-country skiing in the winter continue to be the primary recreation activities occurring within the IRA. Recreational use of the area has increased over time along with the corresponding increase in population and popularity of outdoor recreational activities. Implementation of various forest management activities and the associated increased presence of people, vehicles and associated noise over the years may have temporarily affected the opportunities for solitude and primitive and unconfined recreation.

The IRA continues to provide outstanding opportunities for solitude and primitive recreation. The area has become highly valued due to its proximity to the Bob Marshall Wilderness Complex, and its location within the Southwest Crown of the Continent, an area that links the Canadian Rockies with the Greater Yellowstone Ecosystem and the Selway-Bitteroot Wilderness areas to the south.

Special features and values – Unique ecological, geographical, scenic, and historical features of an area

The Stonewall area is also noted for other features. Red Mountain is the highest peak from Lincoln to Glacier National Park, rising 9,411 feet above sea level. It is one of the few sites in the United States where limber pine and whitebark pine grow together.

The Red Mountain Research Natural Area (RNA) is located approximately 3 miles north of the Stonewall Project area.

The Lewis and Clark Trail passes up Alice Creek over Lewis and Clark Pass. This is of historical interest to many Forest users.

The area also supports a small herd of Rocky Mountain goats near Red Mountain (USDA Forest Service 1986b, FEIS Appendix C-22).

Manageability – The ability to manage an area for wilderness consideration and maintain wilderness attributes.

Because this area surrounds the Bob Marshall, Great Bear and Scapegoat Wilderness Complex, it consists of several long, narrow segments that are usually separated by road corridors. The boundary along the adjacent wilderness areas are usually well defined by high ridges and major topographic features. Other boundaries parallel existing roads or land survey lines which are sometimes difficult to identify (USDA Forest Service 1986b, FEIS Appendix C-12).

The Stonewall area is large enough and the topography is such that any person visiting the area would gain the feeling that they are in a natural area free from human activities and development. The high peaks afford the viewer with vistas of part of the Scapegoat Wilderness mountain ranges and many of the major drainages in the district. Some distant roads and timber harvesting areas can be seen from these high points (USDA Forest Service 1986b, FEIS Appendix C21).

Lincoln Gulch IRA – Roadless Area Characteristics and Wilderness Attributes

The Lincoln Gulch IRA is located approximately 6 miles northwest of Lincoln, MT. The area includes the Ward Creek, Arrastra Creek, and Lincoln Gulch drainages. The terrain is characterized by very steep and timbered slopes. Arrastra Creek, the major drainage, runs northeast to southwest and roughly divides the area in half. The elevation ranges from 4,800 feet on the west side near Patterson Prairie to 7,432 feet on the summit of Black Mountain. The steep terrain confines most use to ridgetops and stream bottoms (USDA Forest Service 1986b, FEIS Appendix C-55).

Wildlife species include elk, mule deer, whitetail deer, black bear, cougar, grizzly bear, wolverine, lynx, bobcat, coyote, other furbearers, numerous grouse species, and several nongame animals and birds. Deer and elk winter range is located along the southwest boundary (USDA Forest Service 1986b, FEIS Appendix C-55).

Recreation use of the area revolves around big game hunting. There are no lakes or major attractions, such as high mountain peaks, to attract large numbers of recreationists (USDA Forest Service 1986b, FEIS Appendix C-55).

Natural – The extent to which long-term ecological processes are intact and operating

Most of the area has had little human influence. The naturalness of the area is similar to that described above for the Bear-Marshall-Scapegoat-Swan IRA, with the exception of trail related impacts, since there are no trails within the Lincoln Gulch IRA.

Undeveloped – The degree to which development and uses are apparent to most visitors

The only disturbance within the area has been from scattered mining activity. The mining activity includes a ditch used for placer mining, which winds through the eastern finger of the area and terminates just south of the area at the old Lincoln Town site. The ditch was built at the turn of the century and has since been reclaimed by nature (USDA Forest Service 1986b, FEIS Appendix C-56).

There are several clearcuts adjacent to the area in the Lincoln Gulch and Beaver Creek drainages. An old logging road, which is no longer drivable, follows the bottom of Arrastra Creek about 200 yards into the area (USDA Forest Service 1986b, FEIS Appendix C-56).

Based on a recent review of management activities implemented by the Helena National Forest, no harvest or fuels activities have been conducted within the Lincoln Gulch IRA. Ongoing activities in the area include noxious weed treatments and livestock grazing. The area remains undeveloped.

Outstanding opportunities for solitude or primitive unconfined recreation – Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

Even though this area is relatively small, it has a very high opportunity for solitude, due to rugged terrain that secludes the visitor from most outside disturbance. Occasional sounds of motorized vehicles or chainsaws can be heard. These sounds are associated with mining, logging, and hunting. The mining and logging would affect the area from spring breakup in May until early winter. Human activity is well dispersed throughout the area because there are no major attractions such as lakes to draw recreation use (USDA Forest Service 1986b, FEIS Appendix C-56).

This area provides excellent primitive recreation opportunities. Because of the heavy timber and lack of trails, there is no motorized access into the area. Hunting and hiking are the main recreation uses. Horseback riding is limited due to topography and vegetative cover. The Lone-Point-Black Mountain ridge provides most of the horseback riding opportunity in this area (USDA Forest Service 1986b, FEIS Appendix C-56).

Hunting and hiking continue to be the primary recreation activities within the IRA. Recreational use of the area has increased over time along with the corresponding increase in population and popularity of outdoor recreational activities. Very few Forest management activities have been implemented and the IRA continues to provide outstanding opportunities for solitude and primitive recreation.

Special features and values – Unique ecological, geographical, scenic, and historical features of an area.

Elk are abundant within this area and it has historically been a productive and primitive hunting area. Lincoln Gulch provides a large big game security area and the rugged terrain gives a hunter a unique challenge (USDA Forest Service 1986b, FEIS Appendix C-57).

Manageability – The ability to manage an area for wilderness consideration and maintain wilderness attributes.

The entire area is on National Forest System land. There are presently no grazing permits or developments in the area. Conflicts might arise between wilderness use and mining or oil and gas exploration (USDA Forest Service 1986b, FEIS Appendix C-57).

Other Unroaded Areas

Geographical Information System (GIS) information was used to assess the Stonewall Project area to determine the extent of other unroaded areas located outside of the inventoried roadless areas. A majority of the project area outside of the IRAs is within 1/8- mile of existing roads. Unroaded areas exist adjacent to the southern boundary of the Lincoln Gulch IRA (two areas approximately 400-600 acres in size, intersected by unit 77), adjacent to the southern boundary of the Bear-Marshall-Scapegoat-Swan IRA (several areas approximately 80-200 acres in size, intersected by units 79 and 86), and adjacent to the Forest boundary along the southern boundary of the project area (an area approximately 300 acres in size, intersected by units 46, 47, and 75). The unroaded lands adjacent to the IRAs have similar roadless characteristics and wilderness attributes as those described above and are considered in this analysis. The small area along the southern project boundary does not meet the inventory criteria in FSH 1909.12 71.1 and is not considered further in this analysis (USDA Forest Service 2010a).

Environmental Consequences

Alternative 1 – No Action Alternative

Direct and Indirect Effects

If the no action alternative is chosen, the proposed regeneration harvests, intermediate harvests, precommercial thinning and prescribed burning would not be implemented within the project area. There would be no direct effects from proposed activities to roadless resources.

However, there would be a chance of an indirect effect under alternative 1, as the ecosystem restoration and fuel reduction project would not occur, and the risk of severe wildfire would remain. In the long term, this may result in indirect effects to roadless resources potentially resulting in changes to the recreation setting or scenic quality of the project area.

An effect to wilderness attributes from taking no action would be to Naturalness (the extent to which long-term ecological processes are intact and operating). Fire would not be reintroduced into this fire-adapted ecosystem, fire suppression efforts would continue and the risk of large, severe wildfires would remain. This may detract from the characteristic of “naturalness” throughout the area, since conditions would not allow the reestablishment of fire as a natural process on the landscape.

Cumulative Effects

There are no known cumulative effects to roadless resources from the no action alternative.

Irreversible and Irretrievable Commitments of Resources

In the no action alternative, there would be no irreversible and irretrievable commitments of resources relevant to the roadless resources within the project area.

Alternative 2 – Proposed Action

Under alternative 2, 8,562 acres are proposed for treatment. The proposed actions, outside of the IRAs, include using both commercial and noncommercial treatments to achieve the desired condition. These actions would include: regeneration harvests, intermediate harvests, precommercial thinnings, and prescribed burning. Implementing the proposed action could include the use of chainsaws, feller bunchers, and cable logging equipment. Approximately 2.5 miles of road would be built for project use then obliterated immediately following timber removal. Post treatment activities would include underburning, site preparation burning, jackpot burning, hand piling/ burning, tree planting, and monitoring of natural regeneration.

The only action proposed within the two IRAs (BMSS and Lincoln Gulch) is prescribed fire and the associated hand slashing of small diameter trees. Commercial harvest and road construction would not occur in the two roadless areas.

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features is displayed in table 9, chapter 2. The FUEL-3 project design feature is relevant to minimizing unauthorized motorized use associated with proposed activities within roadless areas. This analysis is based on the implementation of all design features. Project design features apply to all action alternatives.

Direct and Indirect Effects – Roadless Resources

The activities proposed within the IRAs include construction of fire-lines, hand slashing of small diameter trees and prescribed fire.

Table 181 shows the units and treatments proposed within the roadless expanse:

Table 181. Alternative 2 - Proposed treatment within inventoried roadless areas

Unit Number	Alternative 2 – Proposed Action – Treatment Description	Roadless Area
76	123 acres, Description Group 6 – Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 Acres	Lincoln Gulch IRA
77	541 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Lincoln Gulch IRA and unroaded lands contiguous to the IRA
79	257 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA and unroaded lands contiguous to the IRA
80	280 acres, Description Group 7 – Mixed Severity Fire to Create Mortality Patches up to 5, 10, or 20 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #418
81	607 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA
82	776 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #417,418
83	457 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #417
84	806 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #485
85	87 acres, Description Group 6 – Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #485
86	10 acres, Description Group 7 – Mixed Severity Fire to Create Mortality Patches up to 5, 10, or 20 Acres	Bear-Marshall-Scapegoat-Swan IRA and unroaded lands contiguous to the IRA
87	36 acres, Description Group 7 –	Bear-Marshall-Scapegoat-Swan

Unit Number	Alternative 2 – Proposed Action – Treatment Description	Roadless Area
	Mixed Severity Fire to Create Mortality Patches up to 5, 10, or 20 Acres	IRA
88	865 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA

Effects to Roadless Area Characteristics and Wilderness Attributes for IRAs and Contiguous Unroaded Lands

Roadless Areas: The Bear-Marshall-Scapegoat-Swan Inventoried Roadless Area (IRA) is 848,097 acres and managed by the Helena, Lewis and Clark, Lolo and Flathead National Forests. The portion of the Bear-Marshall-Scapegoat-Swan IRA managed by the Lincoln Ranger District of the Helena National Forest covers 51,339 acres, and the Stonewall Vegetation Project area overlaps with 12,235 acres. The Lincoln Gulch IRA covers 8,247 acres, and the Stonewall Vegetation Project area overlaps with 3,193 acres.

Natural – Reintroducing fire into this fire adapted ecosystem would begin reversing the trends caused from past fire suppression and reduce the risk of large, severe wildfires. This would enhance the characteristic of "naturalness" throughout the area, by establishing forest characteristics that would have been more typical of this area if fire had been allowed to play its natural role in landscape processes.

Management-ignited prescribed fire, however, is a form of "modern human control or manipulation" and would to some extent affect the "untrammeled" and natural character within the roadless areas. There is disagreement about whether the effects of additional management actions such as prescribed fire (i.e., trammeling) to correct the effects of previous management actions such as the suppression of natural fire (i.e., trammeling) is appropriate (Yung, undated).

The proposed action would enhance or help to maintain the roadless resources including high quality soil, water and air; diversity of plant and animal communities; and habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land.

Undeveloped – There would be little evidence that the fires were initiated as a management tool versus natural ignition. The fire hand lines would create a linear disturbance within the roadless area. Stumps from the hand slashing of small diameter trees may remain visible for several seasons following the prescribed fire, which may detract from the undeveloped character for visitors traveling through the roadless area. There are also concerns that the hand lines could encourage unauthorized motorized use. Design features are in place to obliterate fire handlines adjacent to or that intersect existing roads and trails to reduce the potential for unauthorized motorized use (see project design feature: FUEL-3). Blackened trees from the prescribed burning would be noticeable; however, fire is a natural process and should not affect the roadless integrity.

The proposed prescribed fire would help ensure the forest maintains a visual appearance characteristic of a wildfire within its natural regime as opposed to an unnaturally intense wildfire, thereby enhancing or helping to maintain the roadless characteristic of natural appearing landscapes with high scenic integrity. The creation of openings in the forest from low and mixed severity prescribed fire ranging from 5 to 75 acres in size would create a visually appealing mosaic in the landscape, enhancing the overall existing landscape character.

Outstanding opportunities for solitude or primitive unconfined recreation – There may be short-term effects to “solitude” within the project area during project implementation due to the presence of Forest personnel managing the prescribed fire and noise associated with the use of chainsaws for the hand slashing of small diameter trees. The proposed activities would not affect opportunities for “primitive and unconfined type of recreation.” See additional discussion of the roadless resources in Attachment 1: Stonewall Roadless Characteristics Worksheet.

Special features and values – The proposed action would not affect the special features or values of the BMSS IRA because there are no special features within the Stonewall project area. The proposed action would maintain the productive and primitive Elk hunting opportunities within the Lincoln Gulch IRA for approximately15-20 years and enhance these opportunities in the long term. Hand lines within sites could alter historic and prehistoric sites.

Manageability – Overall, the effects to wilderness character within the IRAs would be minor and short term. The proposed action would not affect the suitability of the area for designation as Wilderness pursuant to the Wilderness Act of 1964.

Table D-1 in volume 2, appendix D displays effects to roadless characteristics.

Irreversible and Irretrievable Commitments of Resources

In alternative 2, proposed action, there would be no irreversible and irretrievable commitments of resources relevant to the roadless resources within the project area.

Alternative 3

The actions proposed in alternative 3 differ from those of alternative 2 - proposed action, relevant to the analysis of roadless resources. The relevant changes include fewer units proposed for prescribed fire and hand slashing of small diameter trees within the IRAs. Alternative 3 has no activities planned within the Lincoln Gulch IRA or in the unroaded lands contiguous to this IRA and proposes fewer units for treatment in the BMSS IRA.

The relevant unit changes in alternative 3 are:

Units 76 and 77 proposed for prescribed fire are removed from the Lincoln Gulch IRA and the unroaded lands contiguous to the IRA. The mixed severity prescribed fire proposed for unit 80 is changed to unit 80a, Jackpot burn; and units 81 and 86 of mixed severity prescribed fire are removed from the Bear-Marshall-Scapegoat-Swan IRA and the unroaded lands contiguous to the IRA.

Direct and Indirect Effects

Alternative 3 proposes construction of fire handlines, hand slashing of small diameter trees and prescribed fire within the Bear-Marshall-Scapegoat-Swan IRA and unroaded lands contiguous to the IRA. There are no actions proposed within the Lincoln Gulch IRA or the unroaded lands contiguous to the IRA in alternative 3. Table 182 shows the units and treatments proposed within the roadless expanse.

Table 182. Alternative 3 - proposed treatment within inventoried roadless areas

Unit Number	Alternative 3 – Treatment Description	Roadless Area
79	257 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA and unroaded area contiguous to the IRA
80a	280 acres, Description Group 9 – Low Severity Prescribed Fire	Bear-Marshall-Scapegoat-Swan IRA, Trail #418
82	776 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #417,418
83	457 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #417
84	806 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #485
85	87 acres, Description Group 6 – Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 Acres	Bear-Marshall-Scapegoat-Swan IRA, Trail #485
87	36 acres, Description Group 7 – Mixed Severity Fire to Create Mortality Patches up to 5, 10, or 20 Acres	Bear-Marshall-Scapegoat-Swan IRA
88	865 acres, Description Group 8 – Mixed Severity Fire to Create Mortality Patches up to 30 or 75 Acres	Bear-Marshall-Scapegoat-Swan IRA

Effects to Roadless Area Characteristics and Wilderness Attributes for IRAs and Contiguous Unroaded Lands

Alternative 3 does not propose any treatment within the Lincoln Gulch IRA or unroaded lands contiguous to the IRA, therefore, the impacts would be the same as described in alternative 1- no action.

The impacts from alternative 3 on the BMSS IRA and unroaded lands contiguous to the IRA would be the same as described in alternative 2, proposed action, but would occur on fewer acres due to the elimination of the mixed severity prescribed fire in units 81 and 86.

Irreversible and Irretrievable Commitments of Resources

In alternative 3, there would be no irreversible and irretrievable commitments of resources relevant to the roadless resources within the project area.

Cumulative Effects Common to All Action Alternatives

Cumulative effects to roadless resources were considered within the entire 848,097-acre BMSS IRA that is managed by the Helena, Flathead, Lolo, and Lewis and Clark National Forests, the entire 8,247- acre Lincoln Gulch IRA and the unroaded lands contiguous to the IRAs. Potential cumulative effects to roadless resources are related to other activities occurring within the roadless expanse that have the potential to impact roadless area characteristics or wilderness attributes. Cumulative impacts to roadless resources would result if other activities take place during implementation of the Stonewall Vegetation project, or until vegetation growth obscures the visible stumps from the hand slashing of small diameter trees and hand firelines, approximately 3-5 years.

Past harvest and fuel activities (1954-2010) have been conducted on approximately 76,671 acres across the 848,097-acre BMSS IRA that is managed by four National Forests (37,288 on the Flathead NF;

13,888 on the Helena NF; 17,767 on the Lewis and Clark NF; and, 6,029 on the Lolo NF), or 8.6 percent of the total IRA acreage (see volume 2, appendix C, table C-6).

Recreational activities such as hunting, camping, hiking, off-highway vehicle (OHV) travel on primitive roads, and snowmobiling and cross-country skiing in the winter would continue within the analysis area. Other ongoing and reasonably foreseeable activities that would be occurring within the analysis area include hazard tree removal, weed treatments, trail maintenance, commercial guided recreation, and ongoing use of grazing allotments. All of these activities, when added to the activities proposed in the Stonewall Vegetation Project have the potential to cumulatively affect the roadless values and wilderness attributes within the analysis area. The primary effects would be due to the increased presence of people, vehicles and associated noise that would directly affect solitude and opportunities for primitive and unconfined recreation.

The long-term impacts of other ongoing and reasonably foreseeable activities, such as noxious weed treatment and hazard tree removal, when added to the activities proposed in the Stonewall Vegetation Project, have the potential to cumulatively impact the natural and undeveloped characteristics by causing changes to the scenic qualities within the project area and creating a setting where “resource modifications and utilization practices are evident, but harmonize with the natural environment” as indicated in a Roaded Natural ROS setting. Most of these effects would be beneficial because they would increase the resiliency of forest conditions and reduce the risk of potential negative impacts from severe wildfire, therefore, maintaining the roadless and wilderness qualities that are currently valued by the public. A list of past, present and foreseeable actions relevant to the cumulative effects analysis for roadless resources within the Stonewall analysis area is in volume 2, appendix C, table C-7.

Summary of Effects for All Alternatives

Alternative 1, no action would have no direct or cumulative effects to roadless resources. The purpose and need for the Stonewall Vegetation Project “*… improving the mix of vegetation and structure across the landscape so that it is diverse, resilient, and sustainable to wildfire and insects; modifying fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape; enhancing and restoring aspen, western larch and ponderosa pine species and habitats; utilizing the economic value of trees through removal; and integrating restoration with socioeconomic considerations”* would not be addressed. Potential long-term indirect effects to roadless resources would be due to the ongoing risk of severe wildfire that could lead to changes in the recreation settings, visual qualities and naturalness within the roadless expanse.

In alternative 2, prescribed fire is proposed within IRAs to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 4,182 acres (about 0.5 percent) within the Bear Marshall Scapegoat Swan IRA and on 664 acres (about 7.8 percent) within the Lincoln Gulch IRA. The proposed action would have short-term direct impacts to roadless resources during project implementation such as increased presence of people and noise within the project area. Project design features are in place to limit potential effects. The proposed treatments would address the purpose and need for the Stonewall Vegetation Project, resulting in a more diverse, resilient and sustainable forest ecosystem with a reduction in risk of negative impacts from severe wildfire. The long-term indirect effects from alternative 2 to roadless resources would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area.

Impacts would be stable or improving for a majority of roadless area characteristics and wilderness attributes with short-term impacts to the undeveloped character from the hand slashing of small diameter trees and construction of hand fire lines, short-term impacts to solitude during project implementation, and potential adverse effects to cultural resources.

Cumulative effects to roadless resources would generally be short term and related to an increased presence of people, vehicles and the associated noise that may affect solitude.

In alternative 3, prescribed fire is proposed within the Bear Marshall Scapegoat Swan IRA to promote ecological restoration of a mix of vegetation composition and structure across the landscape. Prescribed fire is proposed on 3,565 acres (about 0.4 percent) within the Bear Marshall Scapegoat Swan IRA. The Lincoln Gulch IRA would not be treated. The effects of alternative 3 relative to roadless resources would be similar to those described for alternative 2, but the impacts would occur on fewer acres. There would be no impacts to the Lincoln Gulch IRA and fewer acres treated within the BMSS IRA.

The alternative comparison summary in chapter 2 provides a comparison of effects from project activities by alternative for roadless resources.

Cumulatively there may be short-term impacts to solitude and undeveloped character with long-term benefits to naturalness throughout the IRA. Additional management activities within the IRA including travel planning, weed treatments and livestock grazing would also occur. These activities are compatible with the management of roadless resources and may cumulatively represent short-term impacts to solitude throughout the IRA due to the presence of people.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed alternatives are consistent with the following:

- Helena National Forest Plan 1986, Management Goals for Management Areas: M-1, T-1, T-2, T-3, T-4, and W-1.
- Forest Service Handbook (FSH) 1909.12 (72.1) – Wilderness Evaluation, that provides definitions for the wilderness attributes of Inventoried Roadless Areas.
- 36 CFR 294.11 – Roadless Area Conservation, Final Rule and related Secretary's Memorandum 1042-155 and 1042-156.
- Forest Service Manual (FSM) 2300 – Recreation, Wilderness and Related Resource Management, guides management of recreation and wilderness resources on National Forest System lands.

As of March 2, 2012, the 2001 Roadless Rule is in full effect after Judge Brimmer (Wyoming) lifted his injunction on the Rule (see the "Roadless Analysis Background and Direction" section in the Inventoried Roadless Area section), The Stonewall project complies with the 2001 Roadless rule, as follows:

d. The cutting, sale, or removal of generally small diameter timber is needed for one of the following purposes and would maintain or improve one or more of the roadless area characteristics as defined in § 294.11. To maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period (36 CFR 294.13(b)(1)(ii)).
e. The cutting, sale, or removal of timber is incidental to the implementation of a management activity not otherwise prohibited by this subpart (36 CFR 294.13(b)(2)).

The cutting of generally small diameter timber is needed to implement the proposed prescribed fire treatments. Consistent with 36 CFR 294.13(b)(1)(ii), prescribed fire is proposed within the Inventoried Roadless Areas (IRA) to promote ecological restoration of a mix of vegetation composition and structure across the landscape. The proposed actions would enhance or help to maintain the roadless characteristics, as defined in 36 CFR 294.11, including high quality soil, water and air; diversity of plant and animal communities; and habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land, and natural appearing landscapes with high scenic quality.

Consistent with 36 CFR 294.13 (b)(2), the cutting of generally small diameter timber is incidental to the implementation of the proposed prescribed fire, a management activity that is not otherwise prohibited by the Roadless Rule.

Scenery

Introduction

The Forest Plan uses Visual Quality Objectives (VQOs) when setting objectives to manage the viewed landscape. The VQOs were determined using the Visual Management System (VMS) framework found in Agricultural Handbook (AH) 462, “National Forest Landscape Management Volume 2, Chapter 1, The Visual Management System”. Components of VMS used when analyzing effects from management activity on the visual resource are discussed in the Methodology section of this analysis. All VMS components referred to in this analysis are defined in the Glossary section. The Visuals Report (Bonnett 2012) was completed to determine compliance with the direction found in the Forest Plan and Other Relevant Laws, Regulations, Policies and Plans.

Overview of Issues Addressed

Comments pertaining to disclosing the effects of project activities on the visual resource were identified from public scoping as nonsignificant (40 CFR 1501.7), and are addressed by the analyses in this section. Please refer to appendix A of the draft environmental impact statement for a complete listing of the issues and an explanation of how the agency determined their disposition.

Indicators

Indicators are defined to analyze data regarding the potential for impacts to scenery from project activities.

- A landscape analyses should be completed to show the changes that would occur from the proposed actions. What are the visual impacts?
    - **Measure:** Effects to visual resources analyzed and VQO forest plan compliance disclosed.
- A feathering of Timber harvest along the existing straight line harvested areas would benefit the existing visual condition. Property lines adjoining private inholdings, state and BLM lands should be considered for this type of timber harvest also.
    - **Measure:** Design features incorporated to reduce the appearance of lines in units adjoining private inholdings, state and BLM lands to meet the visual quality objectives.

The public also submitted comments to consider effects of activities on the Continental Divide National Scenic Trail (CDNST) corridor. The CDNST lies outside the project area and no activities are proposed within a 5-mile distance of the CDNST. Additional comments from the public included the visual benefits of dead trees verses clearcuts as a personal preference and that smoke from burning reduces visibility and diminishes the appreciation for scenic vistas. Assumptions for viewing preferences were based on information in Forest Service handbooks and considered in this analysis. Smoke, reducing visibility within a viewshed, is short term, lasting only the duration of the burn. Therefore, the effect is considered minimal.

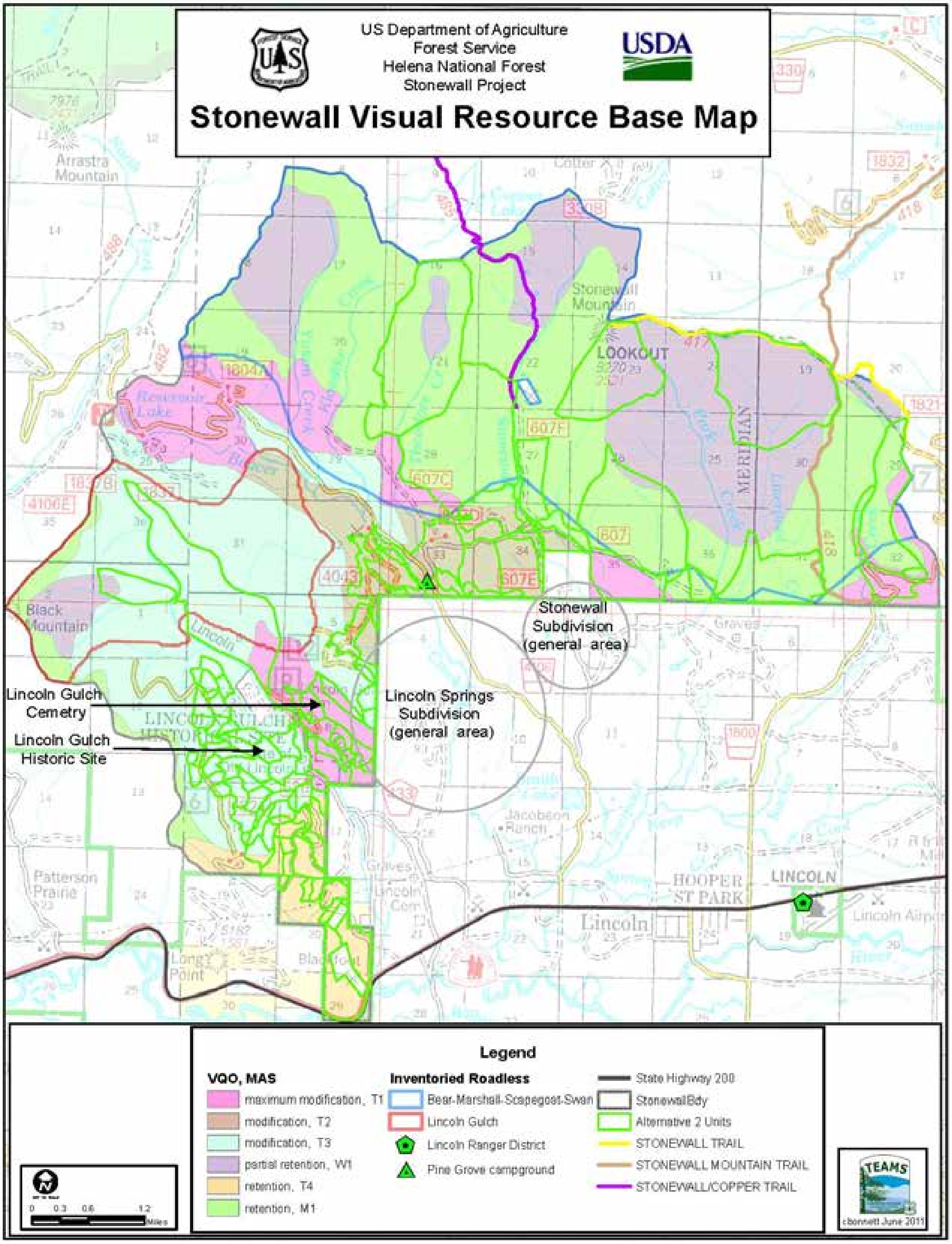


Figure 118. Stonewall Project visual resource

Methodology

The Forest used the Visual Management System (VMS) framework to develop their Visual Quality Objectives (VQOs). The VQOs are used as standards and guidelines when managing the visual resource. The VQO refers to “degree of acceptable alteration of the characteristic landscape” (USDA Forest Service 1974, p. 46). Acceptable alteration is analyzed qualitatively using “degree of alteration” and “duration of impact” components from the “Visual Management System” (USDA Forest Service 1974, p. 28 and 30). In addition, degree of acceptable alteration is determined through the use of other agency handbooks, and professional experience and judgment based on expected outcomes of similar activities elsewhere on the Forest. The current insect conditions (mountain pine beetle epidemic and high levels of western spruce budworm) found in the project area allow the opportunity for the rehabilitation management goal to be used when managing the visual resource (USDA Forest Service 1974, p. 28 and 40). A detailed description of the method used when evaluating the visual resource to disclose effects and determine Forest Plan compliance follows. This methodology was developed under consultation with and approved by the Forest landscape architect.

Seen area was determined per Forest Plan direction. The Forest Plan and information from the Forest landscape architect were used to identify sensitive travel routes, use areas, and water bodies used when determining seen area. The term sensitive area is used throughout this document when referring to sensitive travel routes, use areas, and water bodies. Forest Geographical Information System (GIS) layers and the Helena National Forest America’s Great Outdoors Montana 2006 map were used to locate these sensitive areas on a map used for field reconnaissance. All sensitive areas considered when determining seen area are listed in table 183.

ArcMap GIS was used to display distance zones (foreground, middleground, and background) from sensitive areas when determining seen area. Distance zones of foreground, middleground, and background, are defined in the Glossary section. In addition, views from private lands were considered when determining project seen area. When evaluating effects the most restrictive distance was assigned to a unit if the unit was viewed in more than one distance zone. Table 183 also shows the expected viewed distance zones and seen areas from the sensitive areas. Also, topographic relief displayed on field maps was used to assist in determining seen area during field reconnaissance. Views of the project area were photo documented and are displayed in this section.

The Forest Plan adopted VQO acres for the project area were determined using the Forest VQO GIS layer in conjunction with addition direction per management area found in the Forest Plan. These VQOs are shown on figure 118. GIS analysis was used to determine VQO acres viewed within the project seen area.

Effects from management activities are disclosed. Anticipated changes in the unit’s attributes (basic vegetation patterns, rock formations, and water forms) elements (line, form, color, and texture) were considered when determining direct and indirect effects of viewed management activity (USDA Forest Service 1974, p. 8). This information was then used to determine Forest Plan VQO compliance. Cumulative effects were described in terms of changes in the characteristic landscape attributes (basic vegetation patterns, rock formations, and water forms). Existing viewed disturbances were documented to be used in the appropriate sections in the Affected Environment and Environmental Consequences sections of this analysis. Viewed management activities were analyzed to determine Forest Plan compliance. Distance zones were used when describing the viewed landscape being evaluated (USDA Forest Service 1974, p. 7). Management area direction listed under the Forest Plan and Other Relevant Laws, Regulations, Policies and Plans section was considered for compliance.

Whether the activity stayed within the “degree of alteration” and “duration of impact” acceptable range for the VQO from the perspective of the casual forest visitor was determined (USDA Forest Service 1974,

p. 28 through 32). The acceptable “degree of alteration” for a VQO was determined by comparing expected visual contrast with the surrounding natural landscape (USDA Forest Service 1974, p. 28). The “duration of impact” was determined from estimating the length of time a management activity is expected to be visually evident to the casual Forest visitor (USDA Forest Service 1974, p. 30). Design features were developed to reduce impacts to an acceptable level if it was determined the impacts would not allow the VQO to be met in the short term. Design features were developed to decrease the time the disturbance would be viewed in the landscape and to assure Forest Plan compliance. If the short-term timeframe was not initially met upon implementation of an activity but it was possible to implement a design feature within that same short-term timeframe that allowed the VQO to be met in the long-term time frame then the VQO was considered met. This decision was based on the use of “should” in VMS when describing duration of impact for each VQO (USDA Forest Service 1974, p. 30, 32, 34, and 36) and (USDA Forest Service 1986, p. II/14).

In units where the proposed activity is expected to restore an undesirable visual impact to a desired visual quality, the rehabilitation goal was used (USDA Forest Service 1974, p. 28). With the rehabilitation goal, VQO compliance was determined by first projecting the final outcome of the implementation of the design feature. Then a determination was made as to whether this expected outcome would achieve the assigned VQO. If the design feature applied allowed the disturbance to be minimized to an acceptable level for the VQO within the long-term timeframe of 20 years, then compliance was achieved (USDA Forest Service 1986, p. II/14). Design features were also developed to allow the VQO to be met in the shortest timeframe allowing the desired visual quality to be achieved in the case where the rehabilitation goal is used (USDA Forest Service 1974, p. 40). If design features could not be designed and implemented within the VQO “duration of impact” short-term timeframe, then the VQO would be considered not met (USDA Forest Service 1974, p. 30).

In determining design features the following were considered:

- Professional Experience
- Agriculture Handbook (AH) Numbers 434, 608, 462, 559, and 483 for technical guidance.
- Forest specialists input
- “Northern Region Scenic Resource Mitigation Menu & Design Considerations for Vegetation Treatments” dated March 12, 2009 (unpublished document)

The inventory roadless areas (IRAs) scenic attribute is analyzed in the Inventory Roadless Area Report (Valentine 2015a). This section analyzes the VQOs of these areas where management activity is proposed.

Indicators

The viewed VQO assigned through the Forest Plan within seen areas provided the primary qualitative analysis indicator when determining direct and indirect effects. Consideration of an activity’s “duration of impact” and “degree of alteration” within the viewed VQO also provided qualitative analysis indicators. The degree of acceptable alteration (“degree of alteration” and “duration of impact”) for each VQO was determined considering natural disturbances found in the characteristic landscape (USDA Forest Service 1974, p. 27-28). The size of a management activity is compared to the size of similar natural activities expected in the landscape. Activities mimicking natural disturbances or simulating vegetation patterns found or expected to be found in the landscape are said to be viewed similarly to their natural counterparts by the casual forest visitor. “Duration of impact is discussed in more detail in the Temporal Boundaries section of this report. Changes in the characteristic landscape attributes, when considering past, present, and reasonably foreseeable activities (natural or manmade) within all seen areas, provided the qualitative analysis indicator when determining cumulative effects.

Viewed VQO acres within distances of sensitive areas affected by management activities were determined in order to provide additional quantitative analysis indicators for alternative comparisons (USDA Forest Service 1974, p. 7).

Spatial Boundaries

Views extending beyond the project analysis area from sensitive areas were determined. In addition, views into the project area from sensitive areas and lands of other ownership (i.e., private lands) were determined. All sensitive areas used for this analysis are listed in table 183. When assessing direct and indirect effects, the viewed units within the seen area, as determined from the sensitive areas show on figure 118, were considered the spatial boundary. When assessing cumulative effects all viewed lands within the seen area from sensitive areas listed in table 183 (including sensitive areas listed in the table notes) were considered the spatial boundary.

Temporal Boundaries

The temporal boundary used varied from "immediate upon project completion" up to 5 years (short term) and up to 20 years (long term) when analyzing effects from an activity. The short-term timeframes were determined by reviewing the VQO information provided below. The criteria below was considered short term when determining if the "duration of impact" was met for each VQO upon implementation of a management activity.

- Retention – "Reduction in line, form, color, and texture contrast should be accomplished during operation or immediate upon project completion" (USDA Forest Service 1974, p. 30).
- Partial Retention – "Reduction in line, form, color and texture should be accomplished as soon after project completion as possible or at a minimum within the first year" (USDA Forest Service 1974, p. 32).
- Modification – "Reduction in line, form, color, and texture should be accomplished in the first year or at a minimum should meet existing regional guideline" (USDA Forest Service 1974, p. 34).
- Maximum Modification – "Reduction of contrast should be accomplished in five years" (USDA Forest Service 1974, p. 36).
- Rehabilitation – the VMS does not define a timeframe for duration of impact.

In addition, the following concepts were taken into consideration when compliance with both the "degree of alteration" and "duration of impact" criteria per VQO was determined:

- "Each landscape unit has its individual capacity to accept alteration without losing its inherent visual character" (USDA Forest Service 1974, p. 4).
- "Visual impact of management activities increase as the viewer's line of sight tends to become perpendicular to the slope upon which the management activity is to take place" (USDA Forest Service 1974, p. 4).
- Each objective describes a degree of acceptable alteration of the natural landscape based upon the importance of aesthetics (USDA Forest Service 1974, p. 28).
- Whether or not the disturbance from management activity is consistent with the natural disturbances viewed in the landscape is also considered when determining if a VQO was met (USDA Forest Service 1974, p. 30).

- “Generally, considerable change can take place in the positive or natural appearing elements even under Retention VQO if the change achieves desirable variety and follows the principles of landscape design, such as proper scale and arrangement of these elements” (USDA Forest Service 1980, p. 7).

Incomplete and Unavailable Information

The locations of existing and new landings were not available.

Assumptions

An entire unit was considered viewed if any portion of the unit was viewed from a sensitive area. It was assumed private property adjacent to the project area provided foreground views to the project area. The most revealing distance zone was assigned to the unit if that unit was viewed from multiple distance zones. The most restrictive VQO was assigned to a unit if more than one VQO existed for that unit. Effects to the most restrictive VQO (assigned through Forest Plan direction) from the most revealing distance zone were determined for viewed units. This allowed the greatest potential impact viewed in the landscape to be disclosed.

Design features necessary to meet the most restrictive VQO from the most revealing distance zone were developed. It was assumed a design feature that decreased viewed effects to a VQO from the most revealing distance zone would also decrease the effects viewed from other lesser revealing distance zones. If a design feature was needed to meet a VQO in a viewed unit, it was assumed the design feature would be applied across the entire unit depending on topography and shape of that unit. Existing visual condition of the landscape described in the Affected Environment section and the Affected Environment section in the vegetation section (Amell and Klug 2015) was considered in the determination of whether cumulative effects may have adverse impacts on the characteristic landscape’s attributes. When determining if there would be adverse impacts upon analyzing cumulative effects it was assumed that design features would be implemented.

The rehabilitation goal was used where it was determined proposed activities would not immediately achieve the assigned VQO due to the existence of one of the following scenarios:

- A disturbance (natural or manmade) dominated the unit
- The proposed activity allowed the desired future condition defined in the Silviculture section to be achieve sooner than with no action
- The current existing condition hindered the desired future condition of the landscape to be met in the short term

Dead trees from insect infestations were considered obtrusive elements. It was assumed a landscape with less visible dead trees is a visually desired landscape. These assumptions are based on Forest Service handbook guidance, which states natural disturbances are considered alterations to the characteristic landscape and the characteristic landscape is defined as what visually represents the basic vegetative patterns, landforms, rock formation and water forms viewed (USDA Forest Service 1980, p. 55 and USDA Forest Service 1974, p.7). This assumption differs from some public comments received on personal preferences of viewing aesthetics.

It was assumed existing and new landings may be viewed in units with proposed activities. Specific landing location information was not available. It is assumed that no catastrophic fires or additional fires would occur when analyzing effects for the no action alternative. Beetle caused mortality exists on approximately 40 percent of the existing mature lodgepole pine stands in the project area and is expected to increase.

Affected Environment

Components of the Visual Management System (VMS) used to describe the existing condition of the project area are *characteristic landscape* (vegetative patterns, landforms, rock formations, and water forms) within *distance zones* viewed from primary and secondary travel routes, use areas and water bodies (USDA Forest Service, 1974, p. 7 and p. 18). This description includes management activity (USDA Forest Service 1974, p.8). All travel routes, use areas, and water bodies listed in Appendix B of the Forest plan, identified in the *Stone Dry Vegetation Treatment NFMA Report for Scenery and Recreation September 30, 2009* (USDA Forest Service 2009), incorporated by reference, and additional areas identified by the Forest landscape architect were taken into consideration when determining the existing condition for the project area. Additional affected environment information considered in this analysis can be found in the vegetation section (Amell and Klug 2015).

Existing Condition

Character Type

"The mountains in the Columbia Rockies subregion (character type) are generally rounded and subdued where they have been severely glaciated. Valley floor elevations are about 2,000 feet above sea level and ridgetops range from about 7,000 to over 10,000 feet. Glaciers, permanent snowfields, and craggy topography are outstanding features. Vegetation is moderately varied, with some natural openings. This subregion (character type) contains sagebrush, grasslands, and ancient cedar groves. It is an area of high gradient streams and outstanding high mountain lakes. Hot springs are uncommon, but do occur. Portions of this subregion (character type) have been heavily impacted by past logging and mining practices; large portions are relatively untouched, roadless, and rugged. Natural fire processes are part of this landscape. The landscape character type of the project area is classified as Columbia Rockies" (USDA Forest Service 1980a, Visual Character Types & Variety Class Descriptions, R1 80-11, p.39).

Seen Area Identification

Figure 119 displays visual resource photo points that identify places within the project area where the photos depicted in figure 120 thru figure 129 were taken. It also shows the proposed units for alternative 2, boundaries for inventoried roadless areas and contains information for recreation.

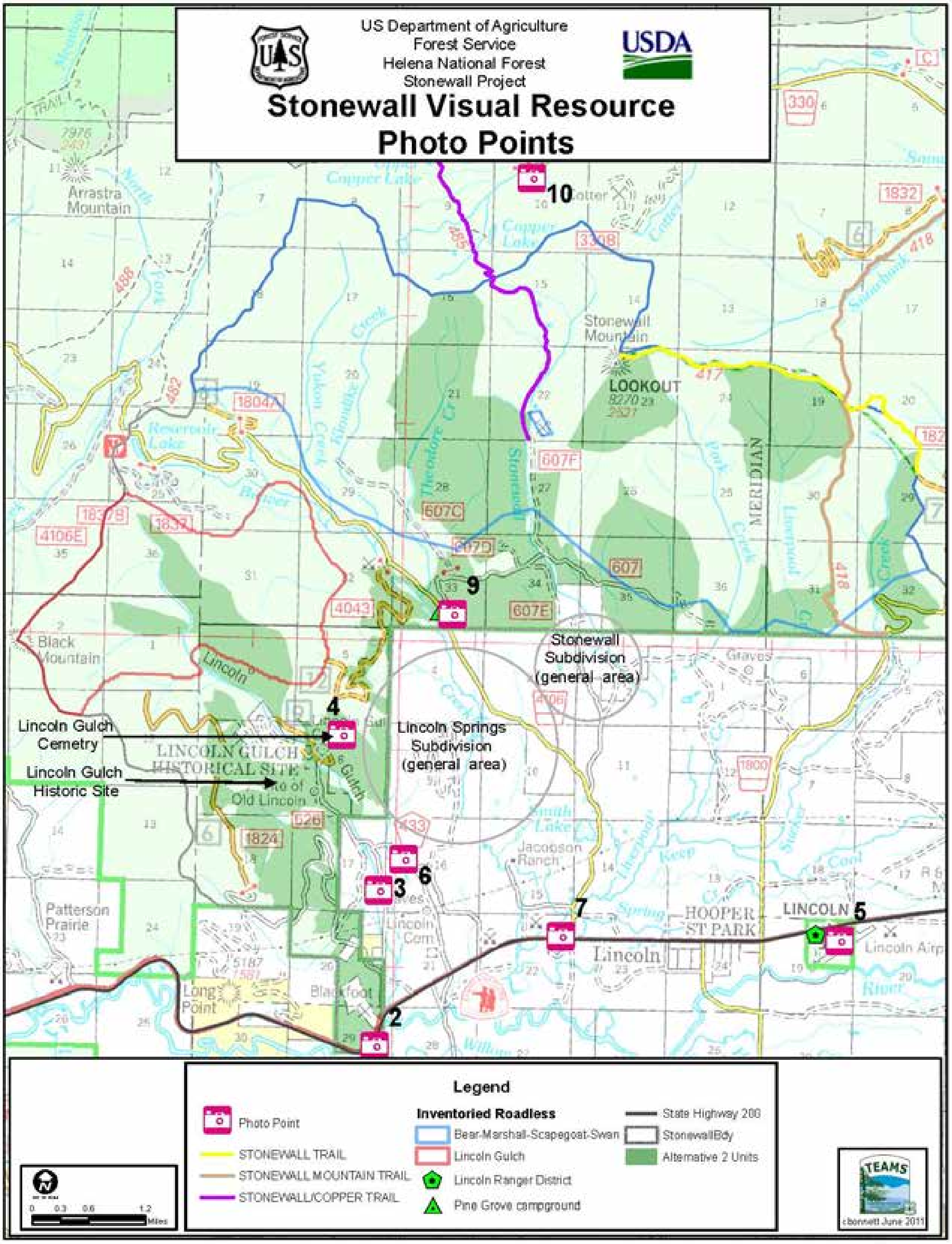


Figure 119. Stonewall Visual Resource Photo Points Map

Mortality caused by beetles exists on approximately 40 percent of the existing, mature lodgepole pine stands in the project area and is expected to increase. These beetle-killed trees, which can be viewed in figure 120, figure 122, and figure 125, negatively impact the landscape. Large portions of the project area can currently be described as a contiguous fuel-bed, with heavy accumulations of dead and down timber.

Figure 120. Photo Point 1-View looking northwest from Forest Route 1040 towards the project area (Approximately 5 miles east of Lincoln, near the Aspen Grove Campground. This is approximately 4 miles southeast of the project area, not displayed in figure 56)

Figure 121. Photo Point 2-View looking north from State Highway 200 into unit 2

Figure 122. Photo Point 3-View north down Forest Route 626

Figure 123. Photo Point 4-View northeast into the project area from Lincoln Gulch cemetery

Figure 124. Photo Point 5-View North from the Lincoln District Office. Due to topography, distance, and vegetative screening, the project area is not seen from the Lincoln District Office.

Figure 125. Photo Point 6-View northwest on County Route 433 into the project area

Figure 126. Photo Point 7-View west down State Highway 200 with the project area in the middleground

Figure 127. Photo Point 10-View south from Forest Route 330 towards Bear-Marshall-Scapegoat-Swan IRA. Due to topography, the project area is not seen from Forest Route 330.

Figure 128. Photo Point 8-View looking southwest from Forest road 330 of Snowbank Lake

Northeast of the project area, not displayed in figure 56. There are no views from the lake into the project units due to the surrounding topography.

Figure 129. Photo Point 9-View within Pine Grove campground

Seen areas for direct and indirect effects along with cumulative effects spatial boundaries were identified during field visits. Sensitive areas used were determine through a combination of areas listed in Management Areas R-1, R-2, areas listed in Appendix B of the Forest Plan and areas listed on page 2 and 6 of the *Stone Dry Vegetation Treatment NFMA Report for Scenery and Recreation September 30, 2009.* Additional sensitive areas given by the Forest landscape architect were also used in seen area determination. Table 183 lists the viewed distance zones into the project area determined from sensitive areas. This total seen area was used for cumulative effects purposes.

The following sensitive areas did not provide views into the Stonewall project area, but were considered for total seen area determination for cumulative effects purposes: Forest System Road 330 (Forest Plan Appendix B), Copper Creek and Aspen Grove Campgrounds (R-2 and Appendix B), Lincoln Ranger Station (Forest Plan Appendix B) figure 6, Continental Divide Trail (Forest Plan), Snowbank Lake (Forest Plan Appendix B), Indian Meadows (R-1 and Forest Plan Appendix B), Silver King Mountain (R-1 and Forest Plan Appendix B), Scapegoat Wilderness (Forest Plan), Stonewall Subdivision (USDA Forest Service 2009).

Table 183. Distance zones viewed into the project area from travel routes, use areas, and water bodies from sensitive areas

Sensitive Areas (Travel Route, Use Area, or Water Body)	Foreground Views	Middleground Views	Background Views	Management Direction
State Highway 200	X	X	N/A	Appendix B of the Forest Plan
Lincoln Gulch IRA (#1601)	X	N/A	N/A	Forest Plan
Bear-Marshal-Scapegoat-Swan IRA (#A1485)	X	N/A	N/A	Forest Plan
Lincoln Springs Subdivision	N/A	X	N/A	USDA FS, 2009
Lincoln Gulch Cemetery	X	N/A	N/A	USDA FS, 2009
Lincoln Gulch Historic Site	X	N/A	N/A	USDA FS, 2009

Sensitive Areas (Travel Route, Use Area, or Water Body)	Foreground Views	Middleground Views	Background Views	Management Direction
Pine Grove Campground	X	N/A	N/A	USDA FS, 2009
Stonewall/Copper Trail	X	N/A	N/A	USDA FS, 1974
Stonewall Trail	X	N/A	N/A	USDA FS, 1974
Stonewall Mountain Trail	X	N/A	N/A	USDA FS, 1974

Distance zone information from table 183along with topography information was used to determine seen areas and viewed units in the field. Viewed units for the proposed action are shown in figure 130 and listed in table 184. All units listed are treated as completely viewed when determining VQO acres for compliance.

Table 184. Proposed action viewed units and their VQO from travel routes, use areas, and water bodies

Travel Route, Use Area, or Water Body	Foreground View Unit/ (VQO)	Middleground Viewed Unit/(VQO)
State Highway 200	1/(R), 2/(R)	*3/(R), *5/(R), *8/(R), *10/(R), *73/(R) 39/(PR), 40/(PR), 41/(PR), 20/(PR), 44/(PR)
Lincoln Gulch IRA (#1601)	76/(PR), 77/(M)	N/A
Bear-Marshal-Scapegoat-Swan IRA (#A1485)	79/(R), 87/(R), 80/(R), 82/(R), 81/(R), 85/(R), 83/(R), 84/(R), 88/(R),	N/A
Lincoln Springs Subdivision	N/A	39/(M), 40/(M), 41/(PR), 20/(PR), 44/(PR)
Lincoln Gulch Cemetery	16/(MM), 17/(MM), 78/MM	N/A
Lincoln Gulch Historic Site	13/(M)	N/A
Pine Grove Campground	46/M	N/A
Stonewall/Copper Trail	84/(R)	N/A
Stonewall Trail	82/(R)	N/A
Stonewall Mountain Trail	82/(R), 80/(R)	N/A

Note: No units are expected to be viewed in the background that are not viewed in the foreground or middleground from the sensitive areas listed in table 3. The VQOs for units were determined using a combination of the Forest VQO map and Forest Plan information (USDA Forest Service 1986), Appendix B, p. B/2. R= retention, PR=partial retention, M=modification, MM=max modification.

*The VQO for units 3, 5, 8 10, and 73 are Retention based on the Forest VQO map which assigned a higher VQO to these areas when compared to using the matrix found in appendix B of the Forest Plan.

Environmental Consequences

Environmental effects for each alternative were considered in detail and described from the expected perspective of the casual Forest visitor (USDA Forest Service 1974, p. 30). Effects from management activities were described using dominant elements (line, form, color, and texture) viewed within distance zones (foreground, middleground, and background) from a travel route, use area, or water body (USDA Forest Service 1974, p. 7 and p. 8). The degree of acceptable alteration ("degree of alteration" and "duration of impact") for each VQO was determined considering natural disturbances found in the characteristic landscape (USDA Forest Service 1974, p. 27, and p. 28). The size of a management activity is compared to the size of similar natural activities expected in the landscape. Activities mimicking natural disturbances or simulating vegetation patterns found or expected to be found in the landscape are said to be viewed similarly to their natural counterparts by the casual forest visitor. All previous information was used when determining acceptable duration of impact and degree of alteration for all effects sections under all alternatives. In addition the “rehabilitation goal” was used, as described in the Methodology section of the Visual Report (Bonnett 2012) based on the criteria in the VMS and direction found in the Forest Plan.

See the Stonewall Vegetation Project Visual Report (Bonnett 2012), incorporated by reference, for more detailed descriptions of effects.

Alternative 1 – No Action

There would be an increase in line, form, and color from viewing beetle infested trees as these trees lose their foliage in the short term. Effects of dead trees in the viewshed are added black lines in the landscape from the dead trees. Loss of these trees would equate to a decrease in the forest canopy followed by an increase in ground texture intermixed with the surrounding, remaining forest canopy leading to various size openings in the long-term. These effects would be noticeable in the foreground and middleground from sensitive areas by the casual forest visitor in the short and long term. Figure 120 shows dead trees in the middleground of the project seen area. Down woody material would increase as dead trees fall, increasing ground fuel density. The increase in fuel density would increase the potential for these areas to experience more intense forest fires.

There would be no vegetation treatments or fuel treatments implemented for alternative 1. There would be no construction of landings or roads built then obliterated in the project area.

Direct and Indirect Effects

There would be no direct or indirect effects for alternative 1 because no project activities are proposed.

Cumulative Effects

There would be no cumulative effects because no project activities are proposed under this alternative.

Conclusion

There are no direct or indirect effects from project activities. Effects from no action, previously described, could lead to an altered viewed landscape in the foreground and middleground views from sensitive areas. These dead trees would provide an altered landscape expected to be viewed as part of a natural disturbance by the casual forest visitor. However, dead trees could be considered undesirable elements in the landscape by some viewers. It could take 20 years or more before areas with beetle mortality fill in with new vegetation, allowing these areas to blend back into the landscape.

Visual quality objectives would be met since no management activity is proposed under this alternative and changes would be from ecological processes. The viewed vegetation patterns found in the characteristic landscape could undergo a change when effects from all infested trees viewed in the total seen area are considered. This alternative is in compliance with Forest Plan, policy, laws and regulations.

Alternative 2 – Proposed Action

The proposed action includes using both commercial and noncommercial treatments to address the purpose and need, and move the project area towards the desired condition. These actions would include: regeneration harvest, intermediate harvest, and prescribed fire. The proposed action includes using prescribed fire and treating slash in inventoried roadless areas (Bear Marshall Scapegoat Swan and Lincoln Gulch). There would be approximately 2.6 miles of roads built then obliterated immediately following timber removal under this alternative. In addition, there would be approximately 45.6 miles of road that would be maintained for use. Commercial harvest and road work would not occur in the two inventoried roadless areas. Implementing the proposed action could include the use of chainsaws, feller bunchers, skidders, and cable logging equipment. Post treatment activities would include underburning, site preparation burning, jackpot burning, hand piling/burning, treeplanting, and monitoring of natural vegetation. Treatment descriptions Groups 1 through 8 apply to alternative 2. Treatment descriptions for each group can be found in chapter 2.

Table 185 lists activities included in the proposed action. Treatments, prescription, and logging systems are defined in the silvicultural report (Amell and Klug 2015). Viewed effects to the visual resource from proposed activities are disclosed. Effects to the viewed landscape (figure 130) were assessed to determine Forest Plan compliance. The visual quality objectives for this project include acres in retention, partial retention, modification, and max modification. The viewed units and their VQOs are listed in table 185. Table 186 shows the total VQO acres proposed for treatments for this alternative within foreground and middleground distances zones.

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. A description of the project design features relating to scenery and other resources is displayed in table 9, chapter 2.

The specific design features listed in table 9 pertaining to scenery/visual are VIS-1 through VIS-13, This analysis is based on the implementation of all design features. Project design features apply to all action alternatives.

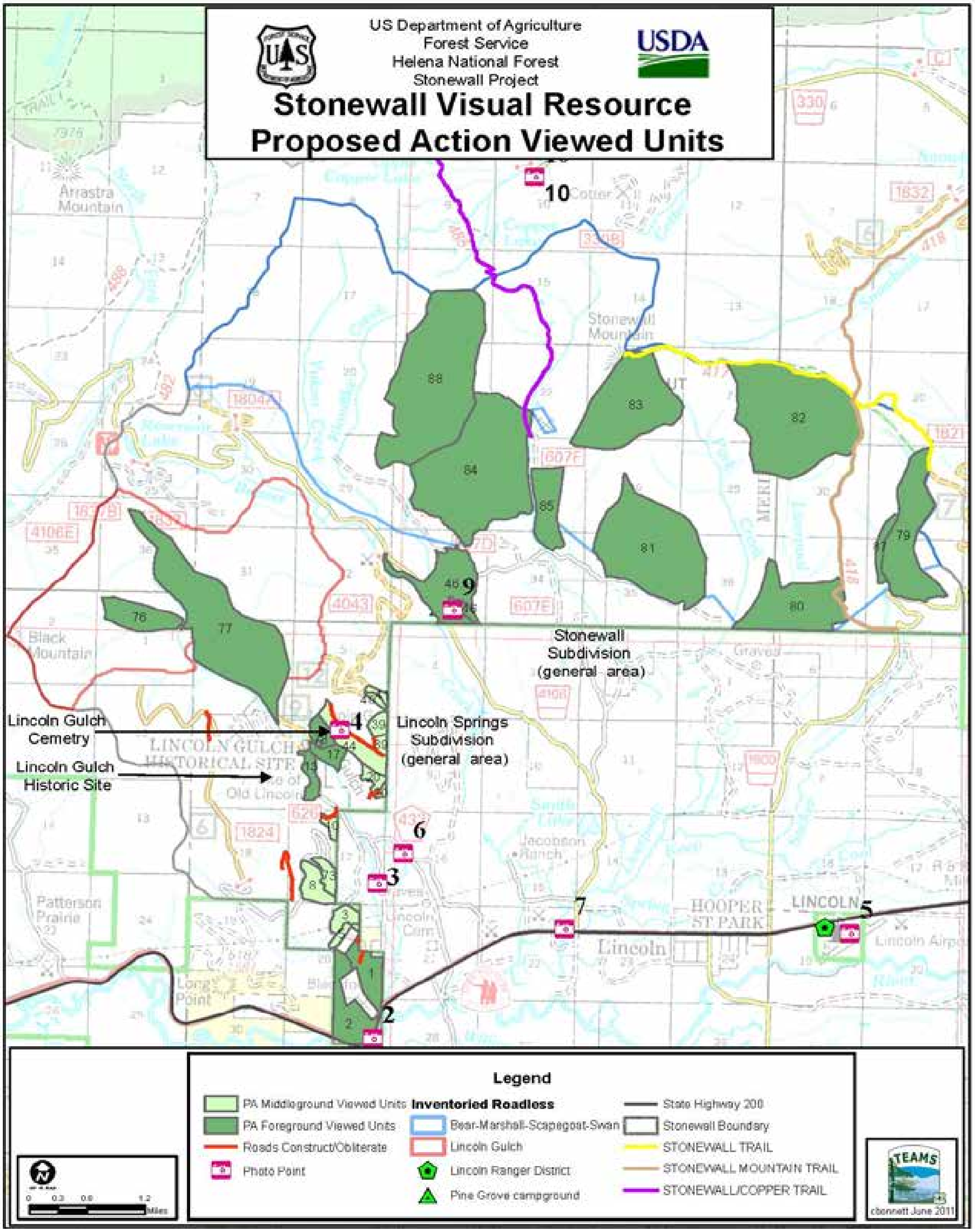


Figure 130. Stonewall visual resource proposed action viewed units

Table 185. Viewed treatment units with proposed vegetation treatment, prescriptions, logging systems, distance zone, and VQO for the alternatives 2 and 3

Treatment	Prescription	Unit	*DZ/VQO	Logging System	Alt 2 Acres	Alt 3 Acres
Intermediate Harvest	Improvement Cut, Underburn	44	MG/PR	skyline	97	
Intermediate Harvest	Improvement Cut, Underburn	46	FG/M	tractor	251	
Intermediate Harvest	Intermediate thin patches	46a	FG/M	tractor		223
Intermediate Harvest	Improvement Cut, Underburn	8	MG/R	skyline	62	62
Intermediate Harvest	Precommercial Thin, Underburn	46b	FG/M	tractor		27
Intermediate Harvest	Precommercial Thin	73	MG/R	HAND	33	33
Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	16	FG/MM	HAND	3	3
Intermediate Harvest	Precommercial Thin, Handpiling, Burn Piles	3	MG/R	tractor	37	37
Intermediate Harvest	Sanitation, Slashing, Handpiling, Burn Piles	5	MG/R	tractor	18	18
Prescribed Fire	Low Severity Fire, Openings <5 acres	2	FG/R	HAND	146	146
Prescribed Fire	Low Severity Fire, Openings <5 acres	78	FG/MM	HAND	38	38
Prescribed Fire	Low Severity Fire, Openings <5 acres	85	FG/R	HAND	143	143
Prescribed Fire	Low-intensity and severity underburning	17a	FS/MM	HAND		38
Prescribed Fire	Low-intensity and severity underburning	20a	MG/PR	HAND		24
Prescribed Fire	Low-intensity and severity underburning	44a	MG/PR	HAND		97
Prescribed Fire	Jackpot burn or pile and burn	46a	FG/M	HAND		223
Prescribed Fire	Jackpot burn or pile and burn	80a	FG/R	HAND		326
Prescribed Fire	Low Severity Fire, Openings <10 acres	76	FG/PR	HAND	123	
Prescribed Fire	Mixed Severity Fire, Openings <20 acres	80	FG/R	HAND	326	
Prescribed Fire	Mixed Severity Fire, Openings <30 acres	77	FG/M	HAND	709	
Prescribed Fire	Mixed Severity Fire, Openings <30 acres	79	FG/R	HAND	337	337
Prescribed Fire	Mixed Severity Fire, Openings <30 acres	81	FG/R	HAND	629	
Prescribed Fire	Mixed Severity Fire, Openings <30 acres	84	FG/R	HAND	831	831
Prescribed Fire	Mixed Severity Fire, Openings <30 acres	88	FG/R	HAND	865	865
Prescribed Fire	Mixed Severity Fire, Openings <5 acres	87	FG/R	HAND	36	36
Prescribed Fire	Mixed Severity Fire, Openings <75 acres	82	FG/R	HAND	776	776

Treatment	Prescription	Unit	*DZ/VQO	Logging System	Alt 2 Acres	Alt 3 Acres
Prescribed Fire	Mixed Severity Fire, Openings <75 acres	83	FG/R	HAND	457	457
Regeneration Harvest	Clearcut with Reserves, Jackpot Burn	17	FG/MM	tractor	38	
Regeneration Harvest	Clearcut with Reserves, Underburn	10	MG/PR	tractor	18	18
Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	13	FG/M	tractor	41	41
Regeneration Harvest	Seedtree with Reserves, Jackpot Burn	20	MG/PR	tractor	32	
Regeneration Harvest	Seedtree with Reserves, Underburn	39	MG/PR	skyline	42	26
Regeneration Harvest	Seedtree with Reserves, Underburn	40	MG/PR	tractor	11	11
Regeneration Harvest	Shelterwood (Group) with Reserves, Site Prep Burn	1	FG/R	tractor	96	96
Regeneration Harvest	Shelterwood (Group) with Reserves, Underburn	41	MG/PR	skyline	12	12
Grand Total					6,206	4,720

*DZ=Distance Zone, FG=Foreground, MG=Middleground, R=Retention, PR=Partial Retention, M=Modification, MM=Maximum Modification. Not all actions in a unit listed above are viewed.

Table 186. Distance zone viewed VQO acres for alternatives 2 and 3

Distance Zone*	VQO	Alt 2 Acres	Alt 3 Acres
Foreground	MM	78	78
Foreground	M	1,000	291
Foreground	PR	126	3
Foreground	R	4,634	4,004
Middleground	MM		
Middleground	M	16	
Middleground	PR	196	1898
Middleground	R	151	151

R=Retention, PR=Partial Retention, M=Modification, MM=Maximum Modification

Direct and Indirect Effects

Proposed activities in treatment units expected to be viewed are displayed in table 185. Units viewed in the background were also viewed in the middle ground and foreground. Not all activities listed under each viewed unit are expected to be viewed as described further for each activity. Viewed effects from management actions are discussed below. Acres for viewed units listed in table 185 are not repeated throughout this section. Sensitive areas are listed in table 184 and are not repeated throughout this section. The discussion that follows addresses effects from proposed activities, determines compliance, and discusses design features necessary for compliance.

Harvest Treatments

Foreground

Marked trees for retention and unit boundaries may be visible in foreground areas. No degree of alteration is expected from this activity. The duration of impact could be more than five years until the marking paint fades. Implementing VIS-10 and VIS-11 would decrease the possibility of painted trees being viewed in the landscape allowing both M and MM to be met.

Upon completion, intermediate thinning, a more open forest at the ground plane and in the mid to upper canopy is expected to be viewed throughout these units. Remaining canopy cover would be less when compared to canopy cover prior to implementation. These effects are expected to last more than 20 years but would not dominate the landscape. Thinning activities would appear similar to other areas found in the landscape that are naturally established over time. The impact from thinning is not expected to be noticeable by the casual forest visitor. Intermediate thinning activities would be considered within the degree of acceptable alteration for both M and MM.

Regeneration treatments (clear cutting, seed tree and shelterwood treatments) would create openings or more open canopy areas in the landscape. These openings and areas of open canopy are not expected to be continuous because the reserve tree technique would be utilized. Clearcut units would be less than 40 acres allowing the openings to mimic other similar size openings occurring naturally in the surrounding landscape. Creating openings could leave a wall of vegetation causing an edge effect that could be noticed by the casual forest visitor as an unnatural activity. When considering the size of the openings, the degree of alteration for MM is expected to be met. If an edge effect is created the duration of impact could last over 20 years. Implementation of design feature VIS-1 which allows the edge effect to be blended and appear natural in the landscape would allow MM to be met.

Middleground

Improvement cuts, precommercial thinning, and sanitation cuts are not expected to be viewed in the middleground from sensitive areas. No viewed effects from sensitive areas are expected upon implementation of these activities in this distance zone.

Regeneration treatments viewed in the middleground would have effects similar to the ones previously described for foreground views. However, these effects would be less visible smaller size leaving for even smaller clearcut areas. Clearcut areas would also be broken up by reserve trees. The degree of alteration would be met even in PR. Implementing design feature VIS-1 would eliminate the edge effect also allowing the duration of impact for PR to be met.

Prescribe fire (Low Severity and Mixed Severity) and Underburning

Foreground

Effects expected to be viewed in the foreground are fire line boundaries and burned ground vegetation with some small pockets of tree mortality with the low and mixed severity burn units and burned vegetation leaving some areas with little tree mortality with underburning. Fire line boundaries could add artificial lines. These boundary lines could look unnatural if straight lines and other geometric patterns are used during unit layout. The line/geometric effect could last more than a year until vegetation begins to grow and blend the unnatural lines into the landscape. The effects from the fire on the ground vegetation and tree mortality is not expected to be discernible as a management activity by the casual forest visitor when compared to effects from other natural fires found in the landscape.

When considering the line effect, the degree of alteration based on the size of the activity in these units would be met for R, MM, and PR. Implementing Vis12/Fuel2 would eliminate artificial lines allowing the duration of impact to be met for all VQOs. This design feature would allow the fire line to look more like a natural fire occurrence.

Handpiling and burning of the piles would add unnatural forms and texture to the landscape that would be viewed. These piles would be burned prior to the completion of the project allowing this effect to meet the duration of impact for M and MM.

Upon handpile and jackpot burning, small pockets of tree mortality in close proximity to the burn piles and charred branches may be viewed from the implementation of this activity. The small pockets of dead trees are not expected to dominate the landscape and can be viewed as part of a natural disturbance. This effect is considered within the degree of acceptable alteration and duration of impact for both M and MM.

Charred branches left over from the burning of piles are expected to be viewed in the landscape. Within five years new vegetation would have grown in, eliminating the possibility to view the burnt vegetation. The degree of alteration for both M and MM would be met. The duration of impact for MM would be met. The duration of impact for M would be met with the implementation of VIS-9 and S/WS/F-12.

Burn activities would temporarily add smoke into the air obstructing foreground and middleground views from sensitive areas. This effect is short term and would subside upon completion of the burning activity. At which point M and MM would be met.

Middleground

The prescribed fire is not expected be viewed in the middleground from sensitive areas. Therefore, no viewed effects are expected from prescribed fire activities for this distance zone for any unit.

After underburning is completed the effects from the activity is not expected to be viewed in the middleground due to the distance the proposed activity would be from sensitive areas and the canopy cover of these units. No viewed effects in the landscape from this activity are anticipated.

Hand piling and burning of the piles are not expected to be viewed from sensitive areas because of the existing overstory in these units, distance to the units from sensitive area, and the undulating topography of the landscape between the sensitive areas and the units. Slashing is not expected to contribute to viewed effects in the landscape.

Transportation

There would be approximately 2.6 miles of road built then obliterated immediately following timber removal under this alternative shown in figure 130. In addition, there would be approximately 45.6 miles of road that would be maintained for use under this alternative.

The road construction work associated with this alternative would not be viewed in the foreground or middleground due to the distance the proposed activity would be from sensitive areas (figure 130). Therefore, there would be no viewed effects from this activity in the landscape.

Cumulative Effects

The characteristic landscape is expected to continue to perpetuate. Management activity viewed disturbances would increase when considering all viewed units proposed for treatment. However, with the project design features the VQOs would be met. Units where dead trees would be removed would ultimately look similar to the end result of the natural decay cycle. This alternative would decrease the length of time the dead trees are viewed in the landscape.

Compliance with Forest Plan and Other Regulations

Activities for the Stonewall Vegetation Project, when implemented with project design features and mitigation measures (chapter 2, table 9), would be in compliance with the Forest Plan for the Helena National Forest (USDA Forest Service 1984) and National and Regional policies, standards, and guidelines in the Forest Service Manuals and Handbooks and the Northern Regional Guide. See the Visuals Report (Bonnet 2012) for more details.

Alternative 3

Alternative 3 includes the same types of treatments and prescriptions as alternative 2 along with Groups 9 and 10 treatments. A complete description of each activity can be found in chapter 2. All effects to the visual resource from proposed activities are disclosed. Effects to the viewed landscape were used to determine Forest Plan compliance. The visual quality objectives for alternative 3 are retention, partial retention, modification, and maximum modification. Figure 131 displays the viewed units and their VQOs.

The viewed units and their VQOs are shown in table 185. Table 186 shows the total VQO acres proposed for treatments for this alternative within foreground and middleground distances zones.

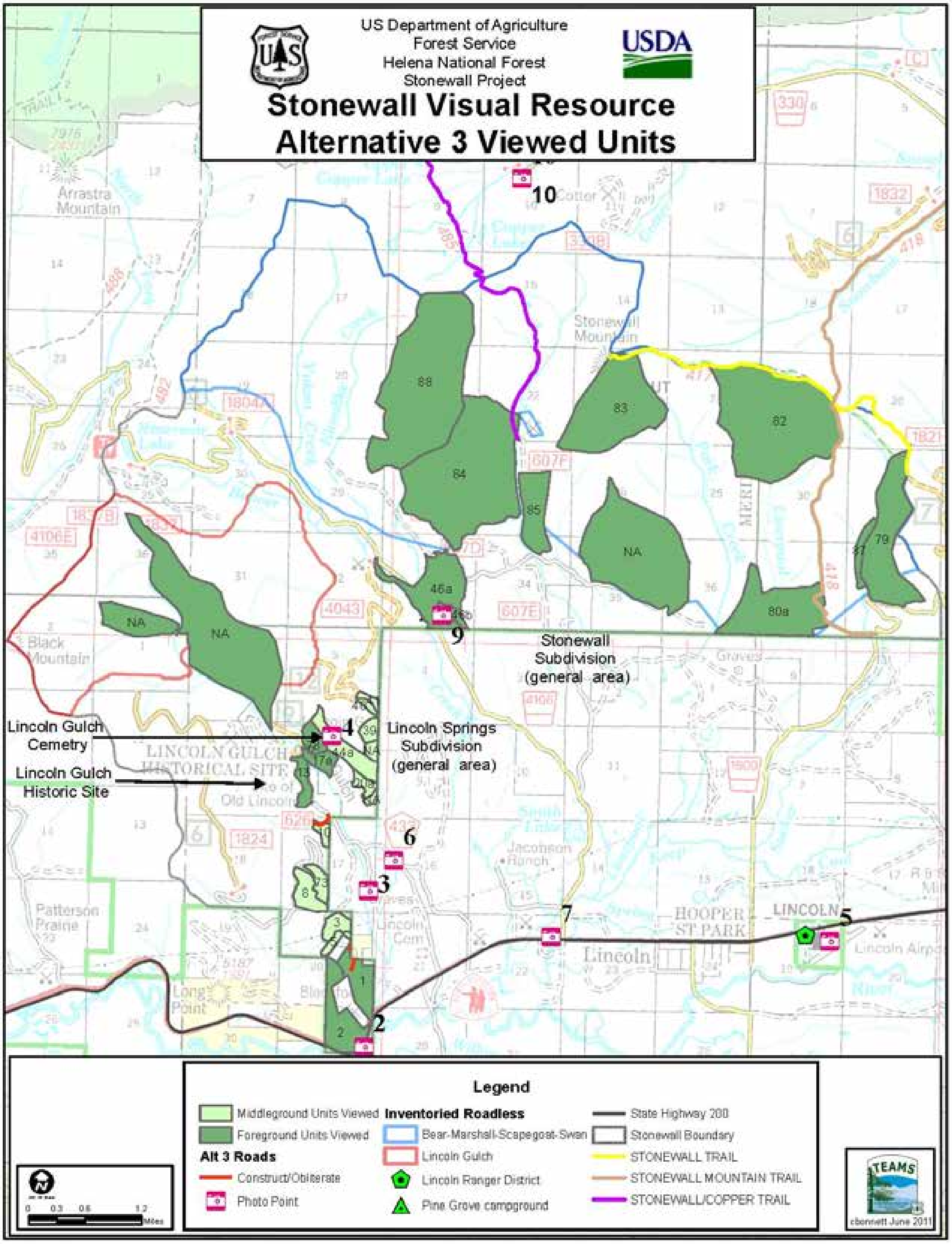


Figure 131. Stonewall visual resource alternative 3 viewed units

Direct and Indirect Effects

All units expected to be viewed and acres of proposed activities for these units are displayed in table 184. Not all activities listed under each viewed unit are expected to be viewed as described further for each activity. Viewed effects from management actions are discussed below. Acres for viewed units listed are not repeated throughout this section. Sensitive areas listed in table 183 are not repeated throughout this section. The discussion that follows addresses effects from proposed activities, determines compliance, and lists design features necessary for compliance.

Harvest Treatments

Foreground

Marked trees for retention and unit boundaries may be visible in foreground areas. No degree of alteration is expected from this activity. The duration of impact could be more than five years until the marking paint fades. Implementing VIS-10 and VIS-11 would decrease the possibility of painted trees being viewed in the landscape allowing both M and MM to be met.

Upon completion, intermediate thinning, a more open forest at the ground plane and in the mid to upper canopy is expected to be viewed throughout these units. Remaining canopy cover would be less when compared to canopy cover prior to implementation. These effects are expected to last more than 20 years but would not dominate the landscape. Thinning activities would appear similar to other areas found in the landscape that are naturally established over time. The impact from thinning is not expected to be noticeable by the casual forest visitor. Intermediate thinning activities would be considered within the degree of acceptable alteration for both M and MM. In foreground areas, when compared to alternative 2, fewer acres are proposed for intermediate thinning treatments in alternative 3.

Regeneration treatments (clear cutting, seed tree and shelterwood treatments) would create openings or more open canopy areas in the landscape. These openings and areas of open canopy are not expected to be continuous because the reserve tree technique would be utilized. Clearcut units would be less than 40 acres allowing the openings to mimic other similar size openings occurring naturally in the surrounding landscape. Creating openings could leave a wall of vegetation causing an edge effect that could be noticed by the casual forest visitor as an unnatural activity. When considering the size of the openings, the degree of alteration for MM is expected to be met. If an edge effect is created the duration of impact could last over 20 years. Implementation of design feature VIS-1 which allows the edge effect to be blended and appear natural in the landscape would allow MM to be met. In foreground areas, when compared to alternative 2, fewer acres are proposed for regeneration harvest in alternative 3.

Middleground

Improvement cuts, precommercial thinning, and sanitation cuts are not expected to be viewed in the middleground from sensitive areas. No viewed effects from sensitive areas are expected upon implementation of these activities in this distance zone. In middleground areas, when compared to alternative 2, fewer acres are proposed for improvement cut in alternative 3.

Regeneration treatments viewed in the middleground would have effects similar to the ones previously described for foreground views. However, these effects would be less visible smaller size leaving for even smaller clearcut areas. Clearcut areas would also be broken up by reserve trees. The degree of alteration would be met even in PR. Implementing design feature VIS-1 would eliminate the edge effect also allowing the duration of impact for PR to be met. In middleground areas, when compared to alternative 2, fewer acres are proposed for regeneration treatments than in alternative 3.

Prescribe fire (Low Severity and Mixed Severity) and Underburning

Foreground

Effects expected to be viewed in the foreground are fire line boundaries and burned ground vegetation with some small pockets of tree mortality with the low and mixed severity burn units and burned vegetation leaving some areas with little tree mortality with underburning. Fire line boundaries could add artificial lines. These boundary lines could look unnatural if straight lines and other geometric patterns are used during unit layout. The line/geometric effect could last more than a year until vegetation begins to grow and blend the unnatural lines into the landscape. The effects from the fire on the ground vegetation and tree mortality is not expected to be discernible as a management activity by the casual forest visitor when compared to effects from other natural fires found in the landscape.

When considering the line effect, the degree of alteration based on the size of the activity in these units would be met for R, MM, and PR. Implementing Vis12/Fuel2 would eliminate artificial lines allowing the duration of impact to be met for all VQOs. This design feature would allow the fire line to look more like a natural fire occurrence. In foreground areas, 326 acres less in the mix severity prescription in alternative 3 when compared to alternative 2.

Handpiling and burning of the piles would add unnatural forms and texture to the landscape that would be viewed. These piles would be burned prior to the completion of the project allowing this effect to meet the duration of impact for M and MM.

Upon handpile and jackpot burning, small pockets of tree mortality in close proximity to the burn piles and charred branches may be viewed from the implementation of this activity. The small pockets of dead trees are not expected to dominate the landscape and can be viewed as part of a natural disturbance. This effect is considered within the degree of acceptable alteration and duration of impact for both M and MM.

Charred branches left over from the burning of piles are expected to be viewed in the landscape. Within five years new vegetation would have grown in, eliminating the possibility to view the burnt vegetation. The degree of alteration for both M and MM would be met. The duration of impact for MM would be met. The duration of impact for M would be met with the implementation of VIS-9 and S/WS/F-12.

Burn activities would temporarily add smoke into the air obstructing foreground and middleground views from sensitive areas. This effect is short term and would subside upon completion of the burning activity. At which point M and MM would be met.

Middleground

The prescribed fire is not expected be viewed in the middleground from sensitive areas. Therefore, no viewed effects are expected from prescribed fire activities for this distance zone for any unit.

After underburning is completed the effects from the activity is not expected to be viewed in the middleground due to the distance the proposed activity would be from sensitive areas and the canopy cover of these units. No viewed effects in the landscape from this activity are anticipated.

Handpiling and burning of the piles are not expected to be viewed from sensitive areas because of the existing overstory in these units, distance to the units from sensitive area, and the undulating topography of the landscape between the sensitive areas and the units. Slashing is not expected to contribute to viewed effects in the landscape.

Proposed underburning increases in overall amount of underburning in middleground for alternative 3 when compared to alternative 2; however, alternative 3 has fewer acres proposed for jackpot burning, when compared to alternative 2.

Slashing is not expected to be viewed in any distance zone from any sensitive areas. Therefore, there would be no viewed effects from this activity in the landscape.

Transportation

There would be 0.4 miles of road constructed for use and then obliterated under this alternative. In addition, there would be approximately 43.8 miles of road that would be maintained for use under this alternative.

The road construction work associated with this alternative would not be viewed in the foreground or middleground due to the distance the proposed activity would be from sensitive areas. Therefore, there would be no viewed effects from this activity in the landscape.

Cumulative Effects

The characteristic landscape is expected to continue to perpetuate. Management activity viewed disturbances would increase when considering all viewed units proposed for treatment. However, with the project design features the VQOs would be met. Units where dead trees would be removed would ultimately look similar to the end result of the natural decay cycle. This alternative would decrease the length of time the dead trees are viewed in the landscape. Cumulative effects for this alternative are expected to be similar to alternative 2, with fewer acres impacted by alternative3.

Compliance with the Forest Plan and other Regulations

Activities for the Stonewall Vegetation Project, when implemented with project design features and mitigation measures (chapter 2, table 9), would be in compliance with the Forest Plan for the Helena National Forest (USDA Forest Service 1984) and National and Regional policies, standards, and guidelines in the Forest Service Manuals and Handbooks and the Northern Regional Guide. See the Visuals Report (Bonnet 2012) for more details.

Conclusions

The action alternatives would be in compliance with the Forest Plan and other regulations with the implementation of the visual design features. Both action alternatives would allow the VQOs to be met.

Cultural Resources

Introduction

This analysis addresses the existing cultural resources within the Stonewall Vegetation Project area and the potential effects to these resources from the proposed project. The Stonewall Vegetation Project area has yielded evidence of prehistoric and historic activity. The term “cultural resource” refers to an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence (FSM 2360). Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties (FSM 2360).

In this analysis, cultural resources include the entire spectrum of resources for which the Heritage Program is responsible for from artifacts to cultural landscapes without regard to eligibility for listing in the National Register of Historic Places (FSM 2360). The cultural and historic context of the Stonewall Project area is examined and cultural resources in the plan area are identified. Existing information is used to assess the condition of these resources, including historic resources in the project area identified as eligible or listed in the National Register of Historic Places and designated traditional cultural properties. Trends that affect these resources are also assessed.

Like much of the HNF, the project area was extensively prospected and mined from the 1860s to the 1940s. The area of potential effects (APE) is covered with scattered prospect pits and trenches, ditches, adits, and related industrial features. In some cases, the treatments proposed for the Stonewall Project would have little adverse effect and require minimal or no mitigation work. For example, running prescribed fire atop scattered prospect pits (dirt piles) or water ditches, and hand-treating fuels in the area, would not cause an adverse effect. The only caution is those ruins that contain wood components that are fragile or flammable, such as historic mine structures.

The results from this analysis dictate what actions will be taken regarding cultural resources, and will serve as the starting point for subsequent cultural resource management decisions associated with this project.

Overview of Issues

The Forest Plan requires the integration of cultural resources in project planning and forest management. Compliance inventory, evaluation of site significance and project effect, consultation with the Montana State Historic Preservation Office and Tribal Historic Preservation Offices, and implementation of mitigation treatment plans for project affected cultural resources would comply with the NHPA and its implementing regulations in 36 CFR 800, as well as Helena National Forest Plan (USDA Forest Service 1986) standards and guidelines.

As currently designed, the project has the potential to adversely affect the integrity of several cultural resources within the APE. Mitigation/protection measures will need SHPO consultation before clearance. It is recommended that Mitigation/protection measures are present in the ROD and agreed upon before a NEPA decision is signed.

Assumptions

The project has supported logging, mining, recreation and utility development during the last 150 years. These activities and particularly the ground disturbance associated with them, have exposed, and in some cases caused damaged to cultural resources. However, it is difficult to quantify the effects of these past actions on cultural resources in the Stonewall project area.

Since the late 1970s, cultural resource inventories have preceded all ground-disturbing Forest Service undertakings in the Stonewall project area including vegetation treatments, restoration, and recreation development. The majority of the cultural resources described in this analysis were discovered as a result of these compliance inventories. In fact, many archaeological sites were found because they were exposed in old road or trail beds and because of mining activities. In most cases, project boundaries and treatments would be reconfigured to avoid impacting significant cultural resources so the effect of these actions on cultural resources would be relatively minor. Ongoing forest activities would continue to have an effect on cultural resources. All forest actions require NHPA and consultation; therefore the effects on cultural resources would be mitigated through project redesign and/or avoidance. Future actions in the analysis area focus on public safety and environmental health and include fire and watershed restoration, hazardous fuels reduction, abandoned mine reclamation, and minor recreation developments, and mineral operations. In all likelihood, the effects of these projects on cultural resources can be mitigated through project re-design and avoidance. Therefore, the current trend for cultural resources is consistent with the Helena National Forest Plan standards and goals.

Design Criteria/Mitigation

The potential adverse effects of the proposed activities could be mitigated through the implementation of mitigation-protection measures, resulting in a no adverse effect finding. Final cultural resource protection measures will need to be consulted on with the SHPO prior to ground disturbance associated with this project. Protection measures include, but are not limited to the following:

- Exclude the affected cultural resource(s) from treatment unit boundaries (avoidance).
- Protect the affected cultural resource(s) through use of alternative treatment methods, such as conducting treatment during the winter, over frozen ground and snow.
- Protect the affected historic ditches by limiting crossing of mechanical equipment and armoring the crossing with logs, soil or other materials to protect the berms.
- Mitigate adverse impacts to the site(s) through historical and archaeological data recovery.

Mitigation measures to reduce cultural resource impacts caused by temporary road construction need to be developed especially when located near or crossing historic ditches and any road associated with the Old Lincoln Townsite.

Information Used

NHPA Section 106 cultural resource inventory for the Stonewall proposed treatment units were conducted during the 2014 field season. Inventories conformed to the Forest Site Identification Strategy and Heritage Program Survey Protocols and will be a reported to the Montana SHPO utilizing standard reporting format. A Stratified Inventory Strategy was used; therefore not all units were inventoried due to ground visibility conditions and slope constraints.

Cultural resource information is somewhat complete for the Stonewall project analysis. For the purpose of this NEPA analysis, it is assumed that existing HNF heritage program data collected from 1979 to 2014 is sufficient to analyze cultural resource density, distribution patterns, and the general range of project effects. Cultural resource site and inventory records are contained in Infra, GIS and hard copy records at the HNF Supervisors Office. Background context for the project area are available in various archaeological and historical documents pertinent to the Stonewall project area (i.e. Beck 1989; Knight 1989).

For purpose of this analysis, the cumulative effects project area boundary is used as the general “heritage analysis area” where contextual research and background record checks provide the information on the existence of or potential for, the occurrence of cultural resources. Within this broader analysis area, a site specific “area of potential effect” (APE) is intensively analyzed under NHPA Section 106 review process. The APE includes treatment units, landings, road construction, and a buffer zone of 50 feet beyond these areas. Where a cultural resource site is partially located within the APE, the effects analysis must be expanded to encompass the entire site (including a buffer). The exception is linear features (such as historic ditches), where the majority of the feature is well outside of the project area. Only the portion of the linear feature that is within the APE was addressed for the Stonewall proposal.

Methodology

Key indicators for heritage resource analysis are generally the list of sites that are eligible for or included in the National Register of Historic Places, or those that have not been evaluated. Those that have been evaluated and found “not eligible” (insignificant) will not have mitigation-protection measure applied.

Other factors for the effects analysis include the potential for the occurrence of cultural resources in areas that have not previously been surveyed, the types of known sites present in the area, and the types of treatments proposed.

Information from historic maps, the heritage resource database, and from surveys done in the project area identifies specific locations of historic sites in and near proposed impact areas. According to criteria outlined in 36 CFR 60.4, some sites have been determined to be historically insignificant. Others are not yet evaluated and therefore are considered to be significant and eligible to be listed in the National Register. Analysis started by considering all known sites for an indication of site types, densities, and potential settings applicable to the study area. Analysis also compared the number of known, potentially eligible sites, or in the case of linear sites, miles of affected segments, to impacts expected to result from activities proposed. They are discussed specifically below.

The following questions are addressed to determine effects on cultural resources in the Stonewall project area:

1. Are the cultural resources evaluated for eligibility for inclusion in the National Register of Historic Places (NRHP)?
2. If the cultural resources are evaluated, are they eligible for inclusion in the NRHP?
3. Will eligible cultural resources be damaged or adversely affected?
4. Will cultural resources that are otherwise ineligible for inclusion in the NRHP, but have value determined by the forest to merit protection, be adversely affected by the proposed project.
5. Will cultural resources be protected and adverse actions mitigated?

Affected Environment

Cultural Resource Context

The prehistory and history of the upper Blackfoot River Valley and analysis area are discussed in various historical records (i.e., UBVHS 1994), cultural resources overviews (i.e., Beck 1989; Knight 1989) and agency heritage compliance inventory reports and are not restated in detail here. As summarized by Davis (2003) for the adjacent Snow Talon fire Salvage project:

> "People have inhabited the upper Blackfoot River Valley for millennia. American Indian groups once occupied, seasonally used or traveled through this large river valley and the adjacent foothills and mountain ranges. Today, the Salish (Flathead) in particular attach great cultural significance to the ancient campsites, hunting and plant food gathering places, tool stone quarries and paint pigment sources, vision questing sites and old trails found throughout the upper Blackfoot River Valley.
>
> The Euro-American settlement of the upper Blackfoot River Valley mirrors that of Montana in general. The Lewis and Clark Expedition of 1804-1806 gave way to fur trapping and trading, then early military expeditions and railroad route explorations. A gold strike in Abe Lincoln Gulch near present day Lincoln brought permanent settlement. Nearby placer mining in Jefferson Creek Nevada Creek, and Washington Creeks attracted more people who eventually established small communities what were supported by mining, farming, ranching and logging. Early in the 20th Century, federal administration of mountain forests and surrounding lands, and increased public participation in outdoor recreation, added other dimensions to the rural life way. This natural resource and tourist oriented economy still characterizes the sparsely populated upper Blackfoot River Valley ."

Existing Condition

The Helena National Forest provided the most up-to-date GIS layers with previous cultural resource inventories and site locations. The Helena National Forest provided the previous site forms and cultural resource inventories performed within the Stonewall Project area. Twenty percent of the Stonewall Project area has been previously surveyed for cultural resources. There have been 23 previous surveys totaling 4,732 acres within the Stonewall Project boundary. The surveys were performed for timber sales, land exchanges, mining claims, and roads projects.

Previous Inventories

The previous cultural resource inventories conducted in the Stonewall Project area yielded nine known cultural resources within the project boundary. Seven sites are located within the APE (in a treatment unit) and two are within the greater project area. These include six historic and three prehistoric cultural resource sites. According to previous cultural resource reports and site forms, two sites are recommended Eligible for the National Register of Historic Places (NRHP), four sites are unevaluated, and three sites are considered ineligible.

Table 187. Previously recorded cultural resources within the Stonewall Vegetation Project boundary

Trinomials	NRHP Status	Site Type	Description	Location
24LC0244/24PW062	Eligible	Historic	Lincoln Ditch	In APE
24LC0421	Not Eligible	Historic	Ditch	In Boundary
24LC0425	Unevaluated	Prehistoric	Lithic Scatter	In Boundary
24LC0467	Eligible	Historic	Old Lincoln Townsite	In APE
24LC0840	Not Eligible	Prehistoric	Lithic Scatter	In APE
24LC1114	Unevaluated	Historic	Kid Kurry Cabin	In APE
24LC1191/24PW0622	Unevaluated	Historic	Lincoln Mining District	In APE
24LC1274	Unevaluated	Historic	Lincoln Arrastra	In APE
24LC1289	Not Eligible	Prehistoric	The Big Blackfoot Site	In APE

In 1983 Helena National Forest proposed a timber harvest in the Lincoln Gulch area TS (1983-04-02) from timber units 0.25 mile west and northwest of the Old Lincoln Townsite (24LC467). Ninety acres of the exclusion zone around the townsite was reviewed with no adverse effect. No additional sites or features were identified.

In 2002 the HNF proposed the Lincoln Springs Fuels Reduction (2002-04-24) project to reduce fuel accumulation in the vicinity of the Old Lincoln Townsite, the Big Blackfoot Mine (24LC828), a lithic scatter (24LC840), the Arrastra site (24LC1274) and the Lincoln Mining District (24LC1191/24PW622). The survey resulted in the identification of additional features just outside of the Old Lincoln Townsite.

In 2005 The Frisbee LEX project (2002-04-24) inventoried 140 acres for a land exchange proposal in Lincoln Gulch. Several previously recorded sites were within the APE and were revisited (24LC828, 24LC840, and 24LC1274), but no new sites were reported.

New Sites Recorded

The 2014 Stonewall Vegetation project (R201301120039B) inventory resulted in the identification of 14 new sites (Table 2), three isolated finds (IF1-3), one updated site (24LC467), and two addendums adding new features and segments to previously recorded sites (24LC244/24PW062 & 24LC1191/24PW622).

Table 188. New sites from inventory of the Stonewall Vegetation project

Trinomials	NRHP Status	Site Type	Description	Location
24LC2300	Eligible	Prehistoric CMT's	Two scarred Ponderosas.	In APE
24LC2301	Not Eligible	Ditch	Long NW-SE trending ditch.	In APE
24LC2302	Eligible	Prehistoric CMT	One scarred Ponderosa .	In APE
24LC2303	Unevaluated	Historic Foundations	Cabin foundations.	In Boundary
24LC2304	Unevaluated	Winchester Cabin	Homestead foundations.	In APE
24LC2305	Not Eligible	Historic Ditch	Ditch with two branches & a can scatter.	In APE
24LC2306	Unevaluated	Historic Complex	A two acre mining area.	In APE
24LC2307	Unevaluated	Historic Ditch	N-S running ditch traversing several units.	In APE
24LC2308	Not Eligible	Cement Wall	Cement diversion & headgate.	In APE
24LC2309	Eligible	Prehistoric CMT	One scarred Ponderosa.	In APE
24LC2310	Eligible	Kosta Cabin	Homestead foundations.	In APE
24LC2311	Unevaluated	Ditch	N-S running ditch.	In APE
24LC2312	Not Eligible	Ditch	Ditch with flowing water.	In APE
24LC2313	Eligible	Prehistoric CMT	One scarred Ponderosa.	In APE

Environmental Consequences

Analysis and Field Methods

Effects to cultural resources were analyzed based on potential damage or adverse effects to all cultural sites within the project boundary. Sources of information examined as part of the background research included the current Heritage GIS layers, reports documenting previous archaeological studies within the project boundary, previous site forms, GLO maps within the APE, and archival documentation of forest service cabins and special use permits through the Lincoln Ranger District office. Research was also performed at the Montana Historical Society in Helena, Montana, and interviews were conducted with members of the Lincoln Historical Society in Lincoln, Montana.

The pedestrian survey of the APE began on June 15 and continued through November 5, 2014. Twenty-eight percent (1,850 acres) of the proposed unit acreage (6,563 acres) was inventoried based upon the

Stonewall (EIS) for phased NHPA compliance (36 CFR 800.4) and the Heritage Survey Implementation Plan. The survey was prioritized, firstly, by high probability areas for site potential, and secondly by pre-implementation units, and thirdly by accessibility of slope and vegetation thickness. The remaining 72 percent of the APE remains un-surveyed due to slopes in excess of 40 percent (low probability) which also included heavy layers of impenetrable downfall and/or extremely thick new growth trees and vegetation resulting from previous timber harvests.

New site data and features were collected with a hand held Juno SB (Trimble unit) preloaded with units shape files and land status boundaries.Survey consisted of pedestrian transects 33-66 feet wide, completed across the unit on a consistent azmuth that insured 100 percent coverage. Visibility was generally poor due to a thick understory of vegetation and duff in combination with layers of dead mature trees crisscrossing the landscape. The steep slopes at the base of Stonewall Mountain between Stonewall Creek and Beaver Creek were the least surveyed in the project due to extreme slope and vegetation constraints. This area does have potential for mining features due to its proximity to Stonewall Creek and strong association to the first mining operations in the area. This area would benefit from post-implementation survey and/or monitoring during treatment activities.

Incomplete and Unavailable Information

The majority of the project area (72%) was not surveyed for cultural resources due to slopes above forty degrees, or very thick new growth vegetation and heavy layers of downfall. There is a good likelihood that sites exist in those areas, because they are in proximity to Stonewall Creek and Theodore Creek used historically by placer miners.

Effects Common to All Alternatives

Cultural resources are non-renewable resources. Continued natural weathering and deterioration cannot be avoided. Regardless of the alternative selected environmental factors, such as wildfires, erosion, snow load, and weather exposure contribute to the deterioration of various types of cultural sites located within the project boundary.

In the Stonewall Project, APE 23 cultural resources have been identified during project-level inventories. Of those cultural resources , seven have been determined eligible for listing in the National Register of Historic Places and are listed in table 187 and table 188. The remaining cultural resources are unevaluated and will be treated as eligible until an official determination can be made.

Effects Common to All Action Alternatives

Positive effects of the action alternatives to heritage resources include an opportunity for the Forest to monitor eligible cultural resources, a reduction in fuel loading, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest.

The most well-known eligible property within the APE is the Old Lincoln Townsite (24LC0467). The Lincoln Gulch was settled by miners in August, 1865. By May 1867, there was a community of 400 men that included a bakery, butcher shop, store, and two saloons. A toll road to Blackfoot City was completed in 1868 and mining activity boomed between 1869 and 1870. By 1873 there were only 60 people left in Lincoln Gulch. The area had produced $7 million in gold. Between 1904 and 1926 various companies placer mined Lincoln Gulch and disturbed initial evidence of early mining activity. In 1931 Lincoln Metal Co. installed draglines in Liverpool Creek. World War II shut down the gold mines but Lincoln Gulch dragline remained open until 1947. The Lincoln Gulch Gold Rush community and cemetery were withdrawn from mineral entry in the 1970s.

Alternative 1 – No Action

Under the no-action alternative, none of the elements of the proposed action would occur in the Stonewall Vegetation Project area.

Direct Effects and Indirect Effects

Under alternative 1, no new direct or indirect effects would occur. Cultural resources would continue to be vulnerable to the effects of fuel loading within the project area, increasing the risk of wildfire. Cultural resources would continue to naturally deteriorate over time. Cultural resources would continue to be threatened by natural processes (wildfire, erosion) and recreational activities that bring people in contact with cultural sites.

Fire has a negative effect on cultural resources due to high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance. Fire suppression activities such as bulldozer-created control lines, hand lines, and fire retardant drops all have the potential to destroy or damage cultural resources. In addition, wildfires cause erosion through vegetation loss resulting in resource deterioration. Vegetation loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Irreversible and Irretrievable Commitments

Removal or disturbance of previously identified or unidentified cultural resources would result in irreversible and irretrievable loss of data. However, there would be no irreversible or irretrievable effects to cultural resources from the Stonewall Project because no actions associated with this project would occur.

Cumulative Effects

This alternative is the existing condition and does not improve cultural resource protection in the Stonewall area. If the no-action alternative is selected then cultural resources within the project area would not be evaluated for the National Register of Historic Places, nominated to the register (if eligible) and managed in such a way as to prevent adverse effects.

Prehistoric and historic properties are a non-renewable resource. They represent a resource base that cannot be replenished. In this sense, all effects are cumulative and work to reduce the archaeological/historical record.

Summary of Effects

The no-action alternative would have an undesired effect on cultural resources. Most significant of these is the increased risk of damage to cultural resources from catastrophic wildfires resulting in artifact damage, wooden structure and feature loss, and loss of site integrity through erosion.

Alternative 2 – Proposed Action

The Helena National Forest proposes to reduce an over-abundance of fuels in the project area near communities and improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects. Proposed treatments for alternative 2 include regeneration harvest, intermediate harvest, precommercial thinning, and prescribed burning on approximately 6,475 acres. All of these actions have the potential to adversely affect cultural resources if mitigation measures are not implemented.

Under alternative 2 a total of 3,295 acres (60 units) have been review and cleared under the NHPA Section 106 process. However, 26 units totaling 1,767 acres still need some level of Section 106 review before implementation of this project. Of these 1,767 acres, 825 acres (22 units) are proposed for mechanical timber harvest.

Approximately 29 units, or 1,251 acres, would need post implementation review for cultural resources under our stratified inventory strategy.

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. In addition to the proposed action treatments described in this section, design features would be implemented where applicable. Table 189 displays how each archaeology design feature would apply for Eligible sites.

A description of the project design features relating to cultural resources and other resources is displayed in table 9, chapter 2. The specific design features listed in table 9 pertaining to archaeological cultural resources are ARCH-1 ARCH-2, and ARCH-3.

This analysis is based on the implementation of all design features. Project design features apply to all action alternatives. If project design features are followed, then it is recommended that the project be allowed to proceed as a *no adverse effect* activity.

Table 189. Project design features required for Eligible sites located in the APE under the action alternatives

Trinomial	Site Type	Treatment	Mitigation Measure
24LC0244/24PW062	Historic	Regeneration Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC0467	Historic	Intermediate and Regeneration Harvest and Prescribed Fire	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC1114	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC1191/24PW0622	Historic – Lincoln Ditch	All treatments	Mechanical equipment crossings need to be approved by Heritage staff prior to implementation. Ditch crossings need to be limited to as few as possible. Ditch crossing methods will need to be approved by Heritage Staff and will require consultation.

Trinomial	Site Type	Treatment	Mitigation Measure
24LC1274	Historic	Regeneration Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2300	Prehistoric	Regeneration Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2302	Prehistoric	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2304	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2306	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2307	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2309	Prehistoric	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2310	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.

Trinomial	Site Type	Treatment	Mitigation Measure
24LC2311	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2312	Historic	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.
24LC2313	Prehistoric	Intermediate Harvest	Create a 30m buffer around site with flagging tape for avoidance. No mechanical thinning within buffered boundaries. Directionally fell trees away from site. Do not pile burn on site. Hand control line as necessary to prevent burn over site.

Direct Effects and Indirect Effects

Under alternative 2 new direct effects would likely occur without mitigation measures. Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed (36CFR800). The proposed action has the potential to directly affect the cultural resources within the proposed project area. Several potential impacts to cultural resources were identified including: thinning projects, the construction of roads built then obliterated, and burn treatments. Direct effects of tree thinning and road construction activities are mostly through ground disturbance caused by ground machinery disturbance, road grading, felling trees, and skidding logs or trees. Felled trees can also damage or destroy features and historic structures. Burn treatments have the potential to adversely affect cultural resources by burning historic structures and damaging or destroying artifacts and features within archaeological sites. For this reason, the mitigation-protections measures need to be followed to avoid an adverse effect to cultural resources.

Indirect effects under the current proposal are related primarily to reducing the risk of wildfires in the project area. Adverse effects to cultural resources tend to be greater in wildfire situations because of high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance (36CFR800). In addition, wildfires cause erosion through vegetation-cover loss, resulting in resource deterioration. Vegetation-cover loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Alternative 3

The Stonewall Project proposes to reduce an over-abundance of fuels in the project area near communities and improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects. Proposed treatments for alternative 3 include regeneration harvest, intermediate harvest, precommercial thinning, and prescribed fire on approximately

6,562 acres. All of these actions have the potential to adversely affect cultural resources if mitigation measures are not implemented. Positive effects of the proposed action to heritage resources include an opportunity for the Forest to monitor eligible cultural sites, a reduction in fuel load, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest.

Under alternative 3 a total of 3,295 acres (60 units) have been review and cleared under the NHPA Section 106 process. However, 12 units totaling 1,168 acres still need some level of Section 106 review before implementation of this project. Of these 1,168 acres, 226 acres (8 units) are proposed for mechanical timber harvest.

Approximately 25 units, or 2,069 acres, would need post-implementation review for cultural resources under our stratified inventory strategy.

Design Features and Mitigation Measures

Same as alternative 2.

Direct Effects and Indirect Effects

Same as alternative 2.

Other Relevant Mandatory Disclosures

As undertakings develop, the Forest is required to comply with the Section 106 process or follow protocol as established with the State Historic Preservation Office.

Conclusions

In summary, the action alternatives 2 and 3 could have both negative and positive impacts on cultural resources within the project area. There would be **no adverse effect** if the proposed project design features and mitigation measures are followed. The negative effects are the possibility unknown cultural resources caused by ground disturbance from the use of heavy machinery, log and tree removal, road construction, and the heat damage to resources from prescribed fires. The loss of vegetation can indirectly lead to vandalism to cultural resources because of the increased visibility. The mitigation measures described in table 9 would mitigate adverse effects to cultural resources within the project area. Positive effects include the reduction of fuels that could result in fire damaged cultural resources and increased erosion of archaeological sites.

Economics

Introduction

The management of the natural resources on the Helena National Forest (HNF) has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visits to the National Forests generate employment and income in the surrounding communities and counties, and generate revenues returned to the Federal Treasury or used to fund additional on-the-ground activities to accomplish resource management objectives.

This section delineates the affected area, assesses potential environmental justice impacts, and outlines methods and results of analyzing the economic effects of the Stonewall Vegetation Management Project, including the project feasibility, financial efficiency, and economic impacts. Project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

Methodology

The economic measures used for this analysis are project feasibility, financial efficiency, economic impacts, and environmental justice. These measures, including methodologies, are described below.

Project Feasibility

Project feasibility is used to determine if a project is feasible, that is, will it sell, given current market conditions. The determination of feasibility relies on a residual value (stumpage = revenues - costs) feasibility analysis that uses local delivered log prices and stump to mill costs to determine if a project is feasible. The appraised stumpage rate from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The project is considered to be feasible if the appraised stumpage rate exceeds the base rates. If the feasibility analysis indicates that the project is not feasible, the project may need to be modified. A project that is not feasible indicates an increased risk that the project may not attract bids and may not be implemented.

Financial Efficiency

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative, including all activities is financially efficient. Financial efficiency analysis is not intended to be a comprehensive analysis that incorporates monetary expressions of all known market and nonmarket benefits and costs. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited financial efficiency framework. These nonmarket benefits and costs associated with the project are discussed throughout the various resource sections of this document.

Costs for restoration activities are based on recent experienced costs and professional estimates. Activity costs not related to the timber sale are included in the PNV analysis, but they are not included in appraised timber value. Two PNV's are calculated, one that includes all costs associated with each alternative and one which includes only those costs that are necessary to facilitate the removal of timber.

Economic Impacts (Jobs and Labor Income)

Economic impacts are used to evaluate potential direct, indirect, and cumulative effects on the economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis. The IMPLAN modeling system (MIG 2003) allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2009 IMPLAN data. IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area's economy.

The economic impact effects are measured by estimating the direct jobs and labor income generated by (1) the processing of the timber volume from the project, and (2) Forest Service expenditures for contracted restoration activities included as part of the proposed treatments. The direct employment and labor income benefits employees and their families and, therefore, directly affects the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Indirect effects are felt by the producers of materials used by the directly affected industries. Induced effects occur when employees of the directly and indirectly affected industries spend the wages they receive. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

Data used to estimate the direct effects from the timber harvest and processing were provided by the University of Montana's Bureau of Business and Economic Research (BBER) (Morgan et al. 2007). This national data is broken into multi-state regions and is considered more accurate than that which is available from IMPLAN. The Northern Rockies BBER Region (Montana and Idaho) is used for this analysis. The BBER data represents the results of mill censuses that correlate production, employment, and labor income. The economic impact area for this analysis consists of Lewis & Clark, Broadwater and Powell Counties, Montana. Potential limitations of these estimates are the time-lag in IMPLAN data and the data intensive nature of the input-output model. Significant changes in economic sectors since the latest data for IMPLAN have been adjusted using information from the University of Montana's BBER.

Environmental Justice

As stated in Executive Order 12898, it is required that all federal actions consider the potential of disproportionate effects on minority and low-income populations in the local region. The principals of environmental justice require agencies to address the equity and fairness implications associated with federal land management actions. The Council on Environmental Quality (CEQ) (1997) provides the following definitions in order to provide guidance with the compliance of environmental justice requirements:

> "Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis..."

> "Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect."

Spatial and Temporal Context for Effects Analysis

The analysis area for the efficiency analysis is the project area (figure 132). The temporal scope of the analysis is the duration of the proposed activities. The project is expected to be accomplished over a 10-year period with the harvest activity occurring primarily in the first 4 years.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties. To estimate the potential effect on jobs and income, a zone of influence (or economic impact area) was delineated. The impact area was chosen based on commuting data suggesting a functioning economy and where the timber is likely to be processed (log flows) (Meti Corp 2010). This analysis suggested that Lewis & Clark, Powell and Broadwater Counties were the appropriate counties to include in the economic impact analysis area (figure 132).

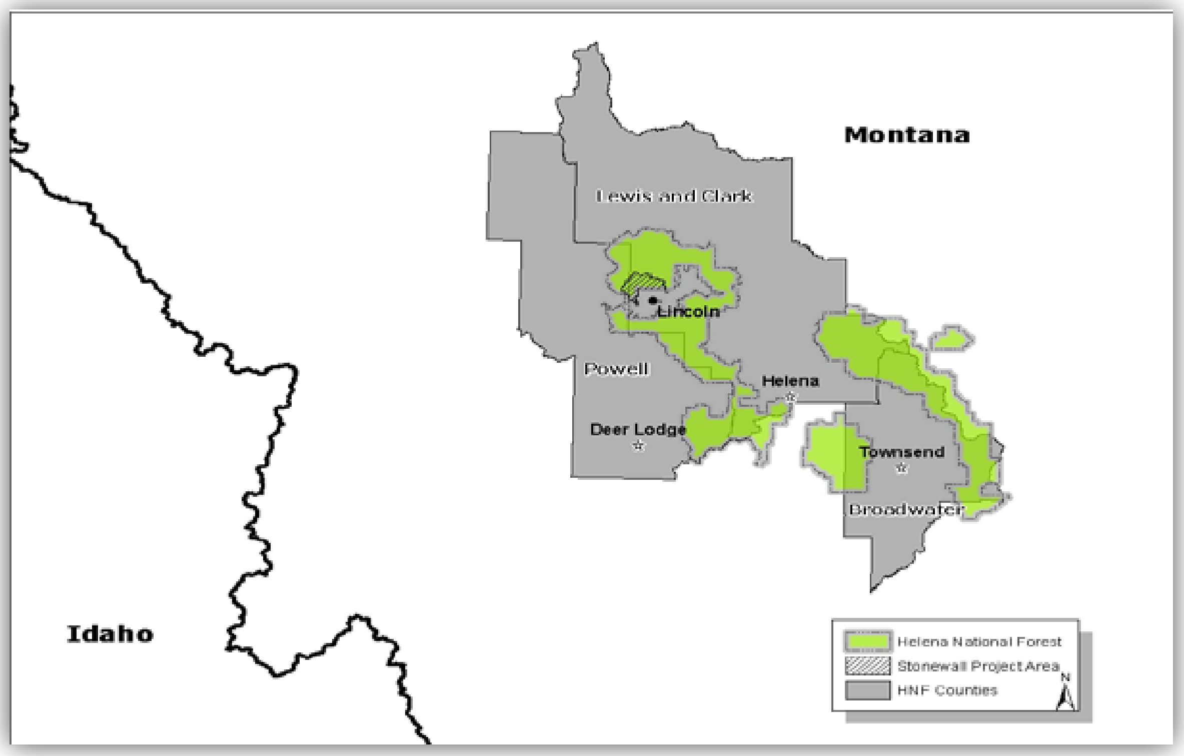


Figure 132. Economic impact area

Affected Environment

The Stonewall Vegetation Project is located on the Lincoln Ranger District of the Helena National Forest and includes portions of both Lewis & Clark and Powell Counties, Montana. Broadwater County and Powell County are likely destinations for the majority of the sawlog material as a result of the project. Since these are the three counties that would be most affected by the project in terms of social and economic effects, the Affected Environment section focuses on these three counties.

Population and Demographic Change

According to the U.S. Census Bureau, the population of Lewis & Clark County grew by 30.2 percent between 1990 and 2009. Powell County grew 6.8 percent while the population of Broadwater County grew by 44.0 percent over the same period (table 190). Population growth in both Lewis & Clark and Broadwater County outpaced the growth observed in the State and Nation. The average state density is 6.8 persons per square mile (US Census Bureau 2010). The analysis area contains one of Western Montana's least densely populated counties, Powell County, with 3.0 persons per square mile. Lewis and Clark County has a density of 18.3 persons per square mile, while Broadwater County has a density of 4.7 persons per square mile.

Table 190. Estimated Population Change 1990 to 2009

COMMUNITY	1990	2000	2009	PERCENT CHANGE
Lewis & Clark County Population	47,586	55,878	61,942	30.2 Increase
Powell County Population	6,640	7,7178	7,089	6.8 Increase
Broadwater County Population	3,328	4,366	4,793	44.0 Increase
State of Montana Population	800,204	903,293	974,989	21.8 Increase

Source: U.S. Census Bureau, 2009 Population Estimates, 2000 Census, 1990 Census

The racial composition of the population in the State of Montana and the analysis area in 2000 is shown in table 191. The overwhelming majority of the population across the state and within Lewis & Clark, Powell and Broadwater Counties is white. The total population of all races other than white was less than 10 percent at both the county and state level.

Table 191. Racial Composition of 2000 Population

	MONTANA	BROADWATER COUNTY, MT	LEWIS AND CLARK COUNTY, MT	POWELL COUNTY, MT	U.S.
Total Population	902,195	4,385	55,716	7,180	281,421,906
Hispanic or Latino (of any race)	18,081	58	843	140	35,305,818
Not Hispanic or Latino	884,114	4,327	54,873	7,040	246,116,088
White alone	807,823	4,214	52,571	6,568	194,552,774
Black or African American alone	2,534	12	104	35	33,947,837
American Indian alone	54,426	50	1,078	244	2,068,883
Asian alone	4,569	5	282	31	10,123,169
Native Hawaiian & Oth.Pacific Is.	425	3	26	0	353,509
Some other race	569	1	16	10	467,770
Two or more races	13,768	42	796	152	4,602,146
Percent of Total					
Hispanic or Latino (of any race)	2.0%	1.3%	1.5%	1.9%	12.5%
Not Hispanic or Latino	98.0%	98.7%	98.5%	98.1%	87.5%
White alone	89.5%	96.1%	94.4%	91.5%	69.1%
Black or African American alone	0.3%	0.3%	0.2%	0.5%	12.1%
American Indian alone	6.0%	1.1%	1.9%	3.4%	0.7%
Asian alone	0.5%	0.1%	0.5%	0.4%	3.6%
Native Hawaiian & Oth.Pacific Is.	0.0%	0.1%	0.0%	0.0%	0.1%
Some other race	0.1%	0.0%	0.0%	0.1%	0.2%
Two or more races	1.5%	1.0%	1.4%	2.1%	1.6%

Employment and Economic Well-Being

From 1970 to 2009, total employment for full- and part-time jobs increased by 121 percent in Broadwater County (from 1,067 to 2,354), Lewis & Clark County employment grew by 162 percent (from 17,317 to 45,758) and Powell County grew by 42 percent (from 2,576 to 3,666)(USDC 2011). The State of Montana saw an increase in total employment of 108 percent, over this same period. State employment growth was largely due to increases in service and professional sector employment (including retail trade, health and social services, transportation, utilities, finance, education, etc.). These sectors represent approximately 61 percent of employment in both counties. By contrast in the three-county impact area, the mining and fossil fuels sector decreased by 17.1 percent between 1990 and 2000.

From 1990 to 2009, average annual unemployment rates in the three counties followed similar patterns as the state and national level, falling to a low of 2.4 percent in September 2007 and rising in response to the economic downturn to a high of 6.7 percent in January 2010. The highest unemployment observed in the three counties was in Powell County, with a rate of 11.0 percent in January 2011(US Department of Labor 2011). Lewis and Clark County also peaked in January 2011 with an unemployment rate of 6.2 percent while at the same time Broadwater County checked in at 9.6 percent Lewis & Clark County has the highest rate of government labor force of the three-county region, which explains the lower unemployment rate during this period, since government employment tends to be more secure.

Per capita income is considered one of the most important measures of economic well-being. However, this measure can be misleading. Per capita income is total personal income divided by population. Because total personal income includes non-labor income sources (dividends, interest, rent and transfer payments), it is possible for per capita income to be relatively high due to the presence of retirees and people with investment income. And because per capita income is calculated using total population and not the labor force as in average earnings per job, it is possible for per capita income to be relatively low when there are a disproportionate number of children and/or elderly people in the population. From 1970 to 2009 all three counties saw increases in per capita income. Broadwater County saw the greatest increase in per capita income of the three county region with a 70 percent increase (adjusted for inflation to 2010$) from $17,752 to $30,203. Lewis & Clark County saw a 65 percent increase (adjusted for inflation to 2010$) from $23,939 to $39,407 while Powell County saw a 49 percent increase from $16,748 to $25,033.

Unlike per capita income, which is affected by nonlabor income, average earnings per job are indicators of the quality of local employment. Higher average earnings per job indicate that there are relatively more high-wage occupations. From 1970 to 2009, Lewis & Clark County saw an 11 percent increase in average earnings (adjusted for inflation to 2010$) from $38,824 to $43,140. Powell County saw a 1 percent decrease (adjusted for inflation to 2010$) from $31,501 to $31,277 while Broadwater County also experienced a 1 percent decrease (adjusted for inflation to 2010$) from $29,243 to $28,854. There are a number of reasons why average earnings per job may decline. These include: (1) more part-time or seasonal workers entering the workforce; (2) a rise in low-wage industries, such as tourism-related sectors; (3) a decline of high-wage industries, such as manufacturing; (4) more lower-paid workers entering the workforce; (5) the presence of a university with increasing enrollment of relatively low-wage students; (6) an influx of workers with low education levels that are paid less; (7) the in-migration of semi-retired workers who work part-time or seasonally; and (8) an influx of people who move to an area for quality of life rather than profit-maximizing reasons.

National and regional trends in industry sectors influence the ability of communities to adapt to changing circumstances. Employment in extractive industries such as timber and mining, as well as in ranching and agriculture, are declining in western Montana. Projections indicate continued declines in employment in these areas. The differences between today’s national forest timber sale program and the program that was in place a decade or so ago has changed. However, the role that timber production from NFS lands plays in national and regional economies through logging and related activities has existed for a considerable time, and is integral to local communities and individuals directly employed by them. In Montana the sale of timber from National Forest lands has declined substantially in the last 30 years from a high of 481 million board feet in 1983 to a low of 66 million board feet in 2003, mainly due to increased litigation and changing market structures. Since the low in 2003, trends have been positive. In 2010, 185 million board feet of timber was sold from National Forest lands in Montana. On the HNF during the same period, the sale of timber has been more erratic with a high of 23 million board feet of timber sold (due to a Mountain Pine Beetle outbreak) in 2010 and a low of 1 million board feet in 1999. The most consistent period was during the 1980s decade when all years saw between 10 and 17 million board feet sold annually. See the Vegetation section for a detail of volume sold in Region One, Montana, Idaho, and the Helena National Forest for the last 30 years. Figure 133 that follows shows a chart graph displaying the same information.

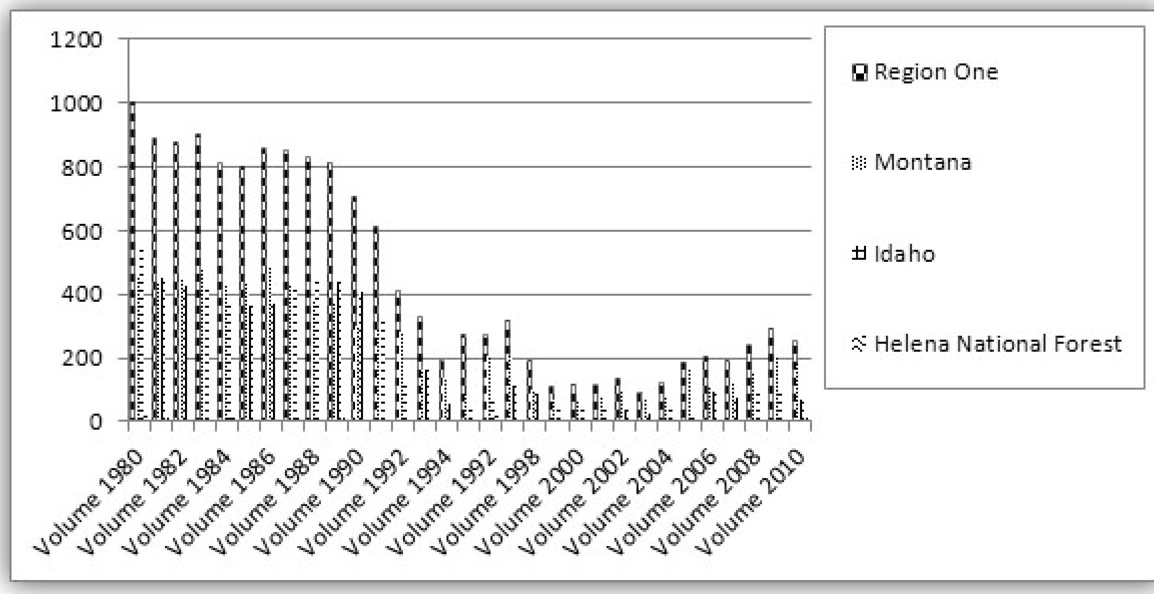


Figure 133. Volume display for R1, Montana, Idaho and HNF from 1980-2010

The Helena National Forest is a major employer and landholder in Montana's capital city and the surrounding communities. Consequently, Forest Service budget reductions and policies impact employment opportunities throughout the region. There have been changes in the forest timber sale program over the past 30 years as objectives have changed and timber harvest levels have declined. The most likely destination of timber from the Stonewall Vegetation Project is Sun Mountain Lumber in Powell County or RY Timber in Broadwater County. The percentage of manufacturing jobs (including forest products) in Powell County in 2000 was 10.7 percent and 17.3 percent in Broadwater County compared with only 3.2 percent in Lewis & Clark County, which does not have a major timber processing facility. There are several small wood processing facilities in the Lincoln Valley that may be a destination for some of the timber products associated with this project.

Alternative 1 – No Action

The no-action alternative would not harvest timber, implement BMPs on haul routes, return fire to the landscape or implement any of the proposed activities, and therefore, incurs no financial costs. Alternative 1 would produce no revenue and have no effects on jobs or income. It would also fail to meet the Helena National Forest Plan for management area T, which emphasizes timber production while protecting other resources.

Alternatives 2 and 3

Project Feasibility

The estimation of project feasibility was based on the Region 1 Sale Feasibility Model, which is a residual value timber appraisal approach. This method takes into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, roads built then obliterated, and road maintenance and results in an accurate timber appraisal and is referred to as stumpage. The appraised stumpage rate from the feasibility analysis is compared to base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury), which in this case is the minimum rate of $3.00/CCF (hundreds of cubic feet). The appraised stumpage rate and base rates for each alternative are displayed in table 192. For each of the action alternatives, the appraised stumpage rate is greater than the base rate, indicating that each of the alternatives is feasible (highly likely to sell).

Conclusions

Alternative 2 has the highest appraised stumpage rate ($6.31/CCF) and, therefore, would likely generate the most revenue. Alternative 3 has a lower appraised stumpage rate ($3.36/CCF), which is nearing the base rate ($3.00/CCF), however it is still likely to sell given current market conditions.

Estimates of timber value are based on current fair market values of timber. Timber markets have fluctuated in the past 5 years, dropping significantly during the 2008 recession, and then rebounding slightly in subsequent years. Current markets have not returned to their pre-2008 levels; however Forest Service timber sales have continued to sell during these challenging markets. A major factor that influences the value of the timber particularly in the Stonewall Project area is the quality of the dead and dying lodgepole pine (LP). A significant percentage of the volume in this project comes from dead and dying LP, the mortality a result of the mountain pine beetle outbreak that began in 2008 and continues today. Following mortality LP retains its value as a sawlog product for a time. As the tree begins to deteriorate that value as a sawlog diminishes, however the tree may still be viable for other less valuable products. Any delay in implementation could negatively affect the feasibility of this timber and jeopardize the purpose and need of this Decision by rendering the project economically infeasible.

Table 192. Project Feasibility and Financial Efficiency Summary (2011 dollars)

Category	Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Timber Harvest Information	Acres Harvested	0	1,969	1,074
	Volume Harvested (CCF)	0	22,022	14,299
	Base Rates ($/CCF)	$0	$3.00	$3.00
	Appraised Stumpage Rate ($/CCF)	$0	$6.31	$3.36
	Predicted High Bid ($/CCF)	$0	$11.96	$9.01
	Total Revenue (Thousands of $)	$0	$241	$119
Timber Harvest & Required Design Criteria	PNV (Thousands of $)	$0	$178	$68

Category	Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Timber Harvest & All Other Planned Non-timber Activities	PNV (Thousands of $)	$0	-$1,231	-$1,096

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and restoration activities associated with the alternatives (as directed in Forest Service Manual 2400-Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and restoration activities are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. If exact costs were not known, the maximum of the cost range was used to produce the most conservative PNV result. The expected revenue for each alternative is the corresponding predicted high bid from the sale feasibility analysis. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The PNV was calculated using a 4 percent real discount rate over the 10-year project lifespan (2013-2022). For more information on the values or costs, see the project file.

This analysis is not intended to be a comprehensive benefit-cost or PNV analysis that incorporates a monetary expression of all known market and nonmarket benefits and costs that are generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. An example of this is the difficulty in capturing the benefits in monetary terms of prescribed fire on wildlife habitat. These benefits are discussed qualitatively throughout the EIS document, within each resource section.

Table 192 summarizes the project feasibility and financial efficiency, including the base rates, appraised stumpage rate, predicted high bid, total revenue, and PNV for each alternative. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. The required design criteria, as used here, include cost allowances for purchaser required work such as road maintenance and purchaser deposits to fund Forest Service work such as brush disposal. For a more detailed view of timber sale related costs, see the Economics project file.

The second PNV includes all costs for each action alternative, including activities that could be funded by the Forest Service, KV or potential Stewardship revenues. The costs used in the PNV calculations can be found in table 193 which displays those activity expenditures associated with each alternative, but not included in the appraisal. Sale preparation costs of $13.50/CCF, sale administration costs of $4.50 per CCF, and regeneration exam costs of $15.00 per acre are excluded from table 6. The cost of sale preparation, sale administration and regeneration exams for alternative 2 is $439,956. The cost of sale preparation, sale administration and regeneration exams for alternative 3 is $298,692.

Stewardship Opportunities

An integrated resource timber contract (IRTC) or stewardship contract as it is more commonly referred to enables the Forest Service to trade goods for services. The Forest Service exchanges timber for an equal value of environmentally beneficial work. Common types of projects included in Stewardship Contracts include weed spraying, road decommissioning, culvert replacement, precommercial thinning, slashing, etc. The starting point for the available revenue is the estimated stumpage value from the sale feasibility analysis minus an allowance for essential regeneration costs. This value is then adjusted downward by 25 percent to account for potential underrun. This stumpage value estimate is applied since it is a conservative value of the timber sale. The 25 percent adjustment provides a cushion to the available revenue estimate to account for potential factors such as the cruise volume being overestimated or degradation of dead material.

No determination has been made as to whether to use a stewardship contract to implement the Stonewall Vegetation Project. Some factors that would determine the use of a stewardship contract include the value of the timber at the time of contract, the availability of needed projects in the area and the level of degradation of the dead lodgepole pine that makes up a large percentage of the sawlog volume in the project. The estimated available revenue after the aforementioned adjustment ranges from approximately $104,069 in alternative 2 to $36,011 in alternative 3. Both alternatives have a high likelihood of selling and producing positive revenue available for stewardship activities. Alternative 2 proposes more acres of harvest, more volume harvested, has higher potential revenue and therefore would generate greater available revenue for stewardship activities.

Conclusions

Table 192 that displays project feasibility and financial efficiency indicates that both action alternatives are financially inefficient (negative PNV) when including all activities associated with the analysis. Table 192 also indicates that both action alternatives are feasible when considering only timber harvest and the required design criteria. Alternative 2 has the highest PNV for the timber harvest and required design criteria at positive $178 thousand, and negative $1.2 million when considering all analysis activities. For alternative 3, the PNV for the timber harvest and required design criteria is positive $68 thousand, and negative $1.1 million for all decision activities. The no-action alternative has no costs or revenues associated with it.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no-action alternative would not harvest timber or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management are nonmarket benefits. These benefits should be considered in conjunction with the financial efficiency information presented here. These nonmarket values are discussed in the various resource sections found in this document.

When evaluating trade-offs, the use of efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified, such as effects on wildlife and the restoration of watersheds and vegetation. The decision maker takes many factors into account in making the decision.

Table 193. Activity Expenditures by Alternative (not included in appraisal)

Activity	Alternative 1	Alternative 2	Alternative 3
Sale preparation	$0	$297,297	$193,036
Sale administration	$0	$99,099	$64,345
Weed Spraying- connected to harvest	$0	$18,000	$18,000
Weed Spraying- not connected to harvest	$0	$31,600	$31,600
Weed Monitoring	$0	$3,333	$3,333
Planting	$0	$493,884	$473,688
Silvicultural exams	$0	$58,575	$43,650
Precommercial Thinning	$0	$405,256	$294,276
Noncommercial thinning/slashing	$0	$5,750	$5,750

Activity	Alternative 1	Alternative 2	Alternative 3
Hand piling and burning of nonactivity fuels- Jackpot	$0	$14,600	$11,900
Post-Harvest Burn	$0	$303,875	$259,000
Prescribed burning	$0	$409,725	$296,550

Economic Impact Effects

The analysis calculated the jobs and labor income associated with the processing of the timber products harvested, and all other activities in the Decision, such as prescribed fire, noncommercial fuel reduction, post-harvest diversity planting, and precommercial thinning. Timber products harvested and the nontimber activities would have direct, indirect, and induced effects on local jobs and labor income. In order to estimate jobs and labor income associated with timber harvest, levels were proportionately broken out by product type (table 194). In order to estimate jobs and labor income associated with reforestation and restoration activities, expenditures for these activities were developed by the resource specialists. Only the expenditures associated with the contracted activities are included in the impact analysis.

Table 194. Proportion of Timber Harvest by Product Type

Product Type	Alternative 2	Alternative 3
Sawmills	70	70
Log Homes	5	5
Post & Poles	5	5
Pulp	20	20

Table 195 displays the direct, indirect and induced, and total estimates for employment (part and full-time) and labor income that may be attributed to each alternative. Since the expenditures occur over time, the estimated impacts of jobs and labor income would be spread out over the life of the project. It is important to note that these may not be new jobs or income, but rather jobs and income that are supported by this project. These impacts are shown both in total (over the life of the project) and on an annual basis. It is anticipated that the timber harvest would occur over a 4-year period.

Table 195. Economic Impacts (Employment and Labor Income), Total and Annual ($2011)

Proposed Activities	Alternatives				
	Alternative 2		Alternative 3		No Action
	Total	Annual	Total	Annual	
Non-timber Activities					
Part and Full Time Jobs Contributed*					
Direct	29	3	25	3	0
Indirect and Induced	8	1	7	1	0
Total	36	4	31	3	0
Labor Income Contributed ($M2011)**					
Direct	$855	$95	$737	$82	$0
Indirect and Induced	$236	$26	$204	$23	$0

Proposed Activities	Alternatives				
	Alternative 2		Alternative 3		No Action
	Total	Annual	Total	Annual	
Total	$1,091	$121	$941	$105	$0
Timber Harvest Activities					
Part and Full Time Jobs Contributed					
Direct	71	18	46	11	0
Indirect and Induced	63	16	41	10	0
Total	134	34	87	22	0
Labor Income Contributed ($M2011)					
Direct	$3,445	$861	$2,237	$559	$0
Indirect and Induced	$3,190	$797	$2,071	$518	$0
Total	$6,635	$1,659	$4,308	$1,077	$0
All Activities					
Part and Full Time Jobs Contributed					
Direct	100	21	71	14	0
Indirect and Induced	71	17	48	11	0
Total	171	38	118	25	0
Labor Income Contributed ($M2011)					
Direct	$4,301	$956	$2,974	$641	$0
Indirect and Induced	$3,425	$824	$2,275	$540	$0
Total	$7,726	$1,780	$5,249	$1,182	$0

* Employment is the total full and part-time wage, salaried, and self-employed jobs in the region.

**Labor income includes the wages, salaries and benefits of workers who are paid by employers and income paid to proprietors.

Conclusions

The no-action alternative would not change jobs or income because there are no proposed project activities associated with this alternative.

Alternative 2 proposes harvest of 22,022 hundred cubic feet (Ccf) of timber products and could result in a total of 171 jobs and labor income at $7.7 million over the life of the project. On an annual basis, this would amount to approximately 38 jobs per year over a period of 10 years. Annual effects are greatest with this alternative since it has the most timber harvest. If the harvest takes longer than anticipated, the total impacts would remain the same, but the annual contributions would be reduced. Approximately 134 direct, indirect and induced jobs and $6.6 million of labor income are associated with the proposed timber harvest activities, with the rest associated with restoration activities.

Alternative 3 proposes harvest of 14,299 Ccf of timber products could result in a total of 118 jobs and $5.2 million in total labor income over the life of the project. On an annual basis, this would amount to approximately 25 jobs per year over a period of 10 years, and $1.2 million annually in total labor income. Approximately 87 direct, indirect and induced jobs and $4.3 million of labor income would be associated with the timber harvest activities, with the rest associated with restoration activities.

Environmental Justice

According to the CEQ's Environmental Justice Guidelines for NEPA (1997), "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." Table 191 shows that the total share of all minority populations represented less than 10 percent of the population in the state and the analysis area in 2000. Thus, the U.S. Census data suggest minority populations within the analysis area do not meet the CEQ's Environmental Justice criterion.

Guidance from CEQ on identifying low-income populations states that "…agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (e.g., migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect." Low-income populations are defined, based on the 2000 Census standard, as persons living below the poverty level (based on total income of $17,604 for a family household of four). Persistent poverty status requires a county to have experienced an individual poverty rate in excess of 20 percent for several Census years. In 2000, 10.8 percent of the population in Broadwater County, 12.6 percent of the population in Powell County and 10.9 percent of the population in Lewis & Clark County were living below the poverty level. Based on these data, the characteristic of persistent poverty is not present in the analysis area.

Conclusions

Table 194 predicts more employment and labor income opportunities would be created by alternatives 2 and 3. Implementation of any of the action alternatives would not likely adversely affect minority or low-income populations. Implementation of the no-action alternative maintains the status quo and provides no additional employment or income in the economic impact area.

The Executive Order also directs agencies to consider patterns of subsistence hunting and fishing when an action proposed by an agency has the potential to affect fish or wildlife. There are no Native American Reservations or designated Native American hunting grounds located in or near the analysis area. None of the alternatives restrict or alter opportunities for subsistence hunting and fishing by Native American tribes. Tribes holding treaty rights for hunting and fishing on the Helena National Forest are included on the project mailing list and have the opportunity to provide comments on this project

Other Disclosures

This DEIS fulfills the requirements for environmental analysis found in NEPA and in the Council on Environmental Quality implementing regulations at 40 CFR, Parts 1500-1508. NEPA at 40 CFR 1502.25(a) directs, "to the fullest extent possible, agencies shall prepare draft environmental impacts statement concurrently with and integrated with... other environmental review laws and executive orders."

The action alternatives would be located entirely on national forest system lands. The action alternatives are not in conflict with planning objectives for County or local tribes.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses, and their effects, are those that occur within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the project design features described in chapter 2, in particular those applying to the soil and water resources.

Under alternatives 2 and 3, openings would be created in regeneration cutting units in the short term, but well-stocked vigorous stands would be established for the long term as a result of post-harvest reforestation and stand tending. Alternatives 2 and 3 would provide timber products, in decreasing yields, to benefit consumers in the short term. With alternatives 2 and 3 harvest units there would be a short-term increase in fuel hazard in the period between harvesting and activity fuel treatment. This would be accompanied by a long-term increase in stand vigor, a reduction in fuel hazard, and a corresponding decrease in the risk of stand-replacing fire occurring within the harvest units. There would also be a 3- to 5-year increase in fuel hazard from post-harvest treatments and a corresponding increase in stand vigor as discussed in the Fire and Fuels section of this chapter.

Big game security habitat under the action alternatives would be reduced, causing short-term habitat degradation. If an action alternative is selected, a site-specific forest plan amendment would be required for Forest Plan standards 3 and 4a (FP pgs. II/17-18), as well as elk standards for thermal and hiding cover in Management Areas T-2 and T-3. The treatments would allow the development of healthy, more vigorous stands that are more sustainable for those habitat values in the long term. These effects are discussed in the Commonly Hunted Species section of this chapter.

Unavoidable Adverse Effects

Implementation of any action alternative could cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Some adverse effects are short term and necessary to achieve long-term beneficial effects. Many adverse effects can be reduced, mitigated, or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences to resource protection standards of the Helena National Forest Plan. The application of project design features was intended to further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects would occur.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are decisions affecting non-renewable resources such as soils, wetlands, cultural resources, or the extinction of a species. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or because the resource has been destroyed or removed. No irreversible commitments of resources were identified.

Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way of road. These are opportunities that are forgone for the period of time that the resource can’t be used. For the action alternatives, there are irretrievable commitments of the growth of forest vegetation from the creation of new landings and new skid trails. This loss is not irreversible. Upon project completion landings, necessary for logging operations, have a low probability of maintaining long-term soil productivity. The type of vegetation growing on these sites will likely be grass and brush. The amount of landings is small and skid trails are expected to recover and are expected to show little to no adverse effects.

Required Permits

At this time it is uncertain whether this project would require a National Pollution Discharge Elimination System (NPDES) permit, due to several factors.

In Northwest Environmental Defense Center v. Brown, 640 F.3d 1063 (9th Cir. 2011) (“NEDC”), the Ninth Circuit Court of Appeals held that stormwater runoff associated with two logging roads that flows into systems of ditches, culverts, and channels before being discharged into forest streams and rivers is a point source discharge for which a National Pollutant Discharge Elimination System (NPDES) permit is required. The Court of Appeals then remanded to the district court for further proceedings consistent with its opinion. The State of Oregon and other parties filed petitions for certiorari with the U.S. Supreme Court to review the Ninth Circuit’s decision. The United States was not a party to litigation.

NEDC v. Brown involved a citizen suit; thus any available relief on remand would be limited to addressing the violation in question and is only binding on the involved parties. Because the USDA Forest Service was not a party, the Ninth Circuit's decision did not impose any affirmative duties on it. However the case has implications for federal land management agencies.

In response to NEDC v. Brown, EPA issued a formal notice on March 23, 2012 in the Federal Register (77 FR 30473) indicating its intent to expeditiously propose revisions to its Phase I stormwater regulations (40 C.F.R. §122.26) to specify that stormwater discharges from logging roads are not stormwater discharges “associated with industrial activity.” The notice also states that EPA intends to further study and seek public comment on alternative approaches for addressing stormwater discharges from forest roads.

Additionally, following the Ninth Circuit's decision, Congress took legislative action suspending any potential permitting requirement imposed by the decision:

> From the date of enactment of this Act until September 30, 2012, the Administrator of the Environmental Protection Agency shall not require a permit under section 402 of the Federal Water Pollution Control Act (33 U.S.C. 1342), nor shall the Administrator directly or indirectly require any State to require a permit, for discharges of stormwater runoff from roads, the construction, use, or maintenance of which are associated with silvicultural activities.

Consolidated Appropriations Act, 2012, § 429, Pub. L. No. 112-74, 125 Stat. 786, 1046-1047 (Dec. 23, 2011).

> Thus, until September 30, 2012, no NPDES permits are required for stormwater discharges from roads associated with silvicultural activities.

Permanent legislation is also pending in both the U.S. Senate and the House of Representatives that would amend Section 402 of Clean Water Act to exempt stormwater discharges resulting from silvicultural activities from NPDES permit requirements.

Due to these factors, it is uncertain at this time whether any NPDES permitting requirements apply, or would apply in the future to stormwater discharges from logging roads. Should it be determined that an NPDES permit is required for this project, the Forest Service will comply with any applicable NPDES permitting requirements.

On March 20, 2013, the United States Supreme Court reversed the Ninth Circuit and held runoff from most logging roads is not storm water runoff related to industrial facilities and so not subject to the Clean Water Act’s requirement for a NPDES permit (Decker v. NEDC). The Supreme Court gave deference to the Environmental Protection Agency’s (EPA) interpretation of its own regulation, the Industrial Stormwater rule, of the Clean Water Act. In a regulation promulgated just prior to the ruling in this case, the EPA found its regulation’s references to facilities, establishments, manufacturing, processing and an industrial plant mean the regulation extends only to traditional industrial buildings, such as factories and associated sites. Most logging roads are not associated with such sites unless they are directly related to raw materials storage areas and sites for the processing of raw materials, such as sawmills. The Court found deference warranted here because the EPA’s interpretation of its regulation was consistent with its earlier regulations. (U.S. S. Ct.).

Roads associated with timber harvest are not considered by the EPA to produce pollutant discharges that require point-source discharge permits because they do not come from industrial sources nor do they result from manufacturing, processing, or raw materials storage areas at an industrial plant. 40 CFR §122.26(b)(14).

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Chapter 4. Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

Interdisciplinary Team Members

Responsible line officer: William Avey, Helena National Forest, Forest Supervisor

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Katherine Carsey	Botanist	Master of Science in Biology, 23 years of experience
Chris Bielecki	Logging Engineer	Bachelor of Science, Forestry; Master of Forestry, Forest Engineering; 16 years of experience
Cameron Bonnett	Landscape Architect (retired)	B.L.A Degree in Landscape Architecture; Master of Science, 20 years of experience
T. Buhl	Fire Management Specialist	Undergraduate education in Range Science and Fire Technology; 17 years of experience in fire and fuels management
Laura Burns	GIS Specialist	Bachelor of Science in Forest Resource Management, fisheries biologist for 17 years and a GIS specialist for 6 years
Cynthia Englebert	Botanist	Bachelor of Science, Range Science; Additional undergraduate work in botany; 18 years of experience
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Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to Federal agencies, federally recognized tribes, State and local governments, and organizations representing a wide range of views.

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Glossary

Active Crown Fire – The surface fire ignites crowns and the fire spread is able to propagate through the tree canopy

Background – The distant part of a landscape, picture, etc.: surroundings, especially those behind something and providing harmony or contrast: surrounding area or surface. Area located from 3-5 miles to infinity from the viewer. (USDA Forest Service 1974, page 44.)

Broadcast burning – Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.

Burn severity – A qualitative assessment of the heat pulse directed toward the ground during a fire. Burn severity relates to soil heating, large fuel and duff consumption, consumption of the litter and organic layer beneath trees and isolated shrubs, and mortality of buried plant parts.

Closure – Roadway blockade to restrict motor vehicle traffic.

Color - A phenomenon of light (as red, brown. pink, etc.) or visual perception that enables one to differentiate otherwise Identical objects. A hue as contrasted with black, white, or gray. (USDA Forest Service 1974, page 44.)

Danger tree – A standing tree that presents a hazard to people due to conditions such as deterioration of or damage to the root system, trunk, stem, or limbs or the direction or lean of the tree

Distance Zones – Areas of landscape denoted by specific distances from the observer. Used as a frame of reference in which to discuss landscape characteristics or activities of man. (USDA Forest Service 1974, page 44.)

Existing visual condition – Current state of the landscape, considering previous human alterations. (USDA Forest Service 1995, Glossary-2)

Foreground – The detailed landscape found within 0 to ¼ - ½ from the observer. (USDA Forest Service 1974, page 45)

Forest road - A road wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

Forest transportation atlas – A display of the system of roads, trails, and airfields of an administrative unit

Forest transportation system – The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands

Form – The shape or structure of something as opposed to the material of which it is composed. (USDA Forest Service 1974, page 45)

Goal – A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principle basis from which objectives are developed. (USDA Forest Service 1986, p. Glossary VI-4)

Line – An intersection of two planes; a point that has been extended; a silhouette of a form (USDA Forest Service 1974, page 45)

Low-Severity Fire – Any surface fire replacing less than 25 percent of the dominant upper canopy layer in a succession class; as a result, low-severity fires can open or maintain a given succession class.

Maintenance – The upkeep of the entire Forest transportation facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization.

Management Standards – A principle requiring a specific level of attainment; a rule to measure against. (USDA Forest Service 1986, p. Glossary VI-6)

Maximum Modification – A VQO meaning man's activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background. (USDA Forest Service 1986, p. Glossary VI-18)

Middleground – The space between the foreground and background in a picture or landscape. The area located from 0.25-0.50 to 3.0-5.0 miles from viewer (USDA Forest Service 1974, page 45.)

Mixed-severity fire – A generally broad fire severity classification that refers to fire effects intermediate between the low severity and replacement severity ends of the fire regimes continuum. For FRCC purposes, mixed-severity fires refer to fires producing between 25 and 75 percent upper-layer replacement during a given event. Mixed-severity fires can open or maintain a succession class.

Modification – A VQO meaning man's activity may dominate the characteristic landscape, but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground. (USDA Forest Service 1986, p. Glossary VI-18)

Mosaic fire – Generally refers to mixed-severity fires. However, the term can be problematic because other fire severity types can produce landscape mosaic patterns composed of a mix of burned and unburned patches. Accordingly, more-precise terms such as low, mixed, or replacement fire may be better terms for describing fire regimes for multiple analysis scales.

National Forest System road – A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

Objective – A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (USDA Forest Service 1986, p. Glossary VI-9)

P**artial Retention** – A VQO that in general means man's activities may be evident but must remain subordinate to the characteristic landscape (USDA Forest Service 1986, p. Glossary VI-18)

Passive Crown Fire – Consuming single or small groups of trees or bushes.

Prescribed burning – Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions that allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Prescribed fire – An intentionally or naturally ignited fire that burns under specified conditions that allow the fire to be confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Rehabilitation – A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality (USDA Forest Service 1974, page 45.)

Retention – A VQO that in general means man's activities are not evident to the casual Forest visitor. (USDA Forest Service 1986, p. Glossary VI-18)

Road – A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Road obliteration – A type of road decommissioning in which the road prism is recontoured;, cut and fill slopes are restored to natural grades; and slash, stumps, and woody debris is placed on top of the corridor to effectively block vehicle travel.

Roaded Modified – A subclass of **Roaded Natural** that has typically been defined as areas exhibiting evidence of Forest management activities that are dominant on the landscape (USDA Forest Service 2003).

Roaded Natural – A classification of the recreation opportunity spectrum where timber harvest or other surface-use practices are evident. Motorized vehicles are permitted on all parts of the road system (USDA Forest Service 1986).

Roads built then obliterated immediately following timber removal - A short-term road constructed solely for use as a project haul route; the road is then decommissioned by obliteration as soon as timber management activities are completed

Seen Area – Total area observed. May be measured in terms of foreground, middleground, and background (USDA Forest Service 1974, page 46.)

Semi-Primitive – A classification of recreation opportunity spectrum that characterizes a predominately natural or natural appearing environment of a moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but subtle. In areas designated as **Semi-Primitive Motorized**, motorized use may occur on primitive roads and motorized trails.

Subordinate – Inferior to or place below another in size, brightness, etc.; secondary in visual impact (USDA Forest Service 1974, page 46.)

Surface Fire – Fire that burns loose debris on the surface, which include dead branches, leaves, and low vegetation. Surface fire burns only in the surface fuelbed.

Surface Fuels – Fuels that contact the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.

Texture – The visual or tactile surface or characteristics of something. (USDA Forest Service 1974, page 46.)

Underburning – Prescribed burning in activity-created or natural fuels beneath a forest canopy, usually with the objective of preserving the dominant over story trees.

Visual Quality Objectives (VQO) – A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape. (USDA Forest Service 1986, p. Glossary VI-18)

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